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MATERIA MEDICA

AND

PHARMACY

WILCOX

BY THE SAME AUTHOR

PHARMACOLOGY AND THERAPEUTICS

Seventh Edition

In this companion work to Materia Medica and Pharmacy, which logically precedes, the classification is one based on the particular physiological systems upon which the various agents principally act. There is a complete list of Pharmacopœial drugs and preparations, together with such unofficial remedies as experience has found to be useful, without special description, except as to dosage, and very elaborate accounts of their pharmacological action and therapeutics are given. In these descriptions the author has endeavored to present the latest views of the highest authorities in these departments and to render the book as practically useful as possible by full details regarding treatment. The course on Pharmacology and Therapeutics should include laboratory and clinical demonstrations of the use of remedial agents. The two works combined offer, it is believed, a very complete presentation of the whole subject of the Materia Medica and Therapeutics of the present time.

MATERIA MEDICA

AND

PHARMACY

BY

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SEVENTH EDITION, REVISED

PHILADELPHIA

P. BLAKISTON'S SON & CO.

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1907

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PREFACE

In this revision every effort has been made toward condensation so far as is compatible with clearness. The many advances in the subjects here treated have necessitated the division of the work into two distinct parts; this, the first, being devoted to Materia Medica and Pharmacy, and the second to Pharmacology and Therapeutics. It is hoped that this natural separation of the subjects will be acceptable to the physician and the student. In this volume full attention is given to pharmaceutical processes, to the various kinds of preparations, with their dosage, and to the art of prescribing; after which the description of remedies is taken up in detail. The list of therapeutic agents is divided into two main parts, under the heads of Inorganic and Organic Materia Medica, and the general classification adopted is one based on the grouping of the articles according to the chemical or physiological division to which each belongs. In order to make the book more complete, condensed descriptions of the action and uses of all the remedies have been appended. The course on Materia Medica should include performance of the simpler pharmaceutical operations, demonstrations of the official drugs and preparations, and practice in prescription writing. The two works combined offer, it is believed, a very complete presentation of the whole subject of Materia Medica and Therapeutics.

For valuable assistance, in revision and in proof-reading, the author would acknowledge the esteemed services of Doctor P. Brynberg Porter.

The Author.

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MATERIA MEDICA AND PHARMACY.

DEFINITIONS.

Materia Medica.—The materials used in the treatment of disease.

Pharmacy.—The art of preparing drugs in a form suitable for use as remedial agents and of dispensing them.

Pharmacopœia.—A code of remedial agents, usually with descriptions, definitions or directions, prepared by experts appointed by authority, and intended to serve as a standard until superseded by a new one. By admitting certain articles to its pages, it declares them to be of importance, through the extent of their use, or to be entitled to confidence because of their value, or both, in the practice of medicine, but does not, necessarily, deny these properties to articles not admitted. It fixes their official title or titles, and often their leading synonym or synonyms. Usually it defines them, describes them with completeness sufficient to provide for identification and determination of the proper degree of purity, or strength, or both, and details and recommends such operations in preparing them as pertain to a dispensing pharmacy. It may, in addition, fix doses and provide rules, formulæ, tables, and other information and directions of importance in the practice of pharmacy and medicine. It also fixes a date upon which its authority shall commence. Everything contained in the United States Pharmacopœia (abbreviation "**U. S. P.**") is said to be "official."

The United States Pharmacopœia is prepared by a committee, meeting at the beginning of each decade, consisting of delegates appointed by invitation, extended by the President of

the preceding Convention, to all incorporated medical and pharmaceutical societies and medical and pharmaceutical colleges, and to the United States Army, Navy, and Marine Hospital Service. By Congressional action the **U. S. P.** is made a legal authority in the conduct of the Department of Customs, of the Army, Navy, and Marine Hospital Service, and of the District of Columbia and other Territories within the jurisdiction of the United States laws. By legislative enactment it is also made a legal authority within the jurisdiction of many States. The present edition, which is the first to contain doses, became official on September 1, 1905.

PHARMACY.

Pharmacy covers a field of nearly as much importance, breadth and difficulty as that of medicine itself, and requires a special, extensive and thorough preparation. It should never be practiced by the physician, when the services of a competent manufacturing or dispensing pharmacist can be utilized. The physician should, however, be acquainted with the general principles and most details of the science and art of Pharmacy, that he may judge intelligently of the services rendered him by the pharmacist, and also be prepared to act with safety himself in cases of emergency. A pharmaceutical education to this extent, accompanied by dispensary practice, should be provided for in every thorough course of medical study. The more important terms pertaining to Pharmacy are defined and explained below.

DEFINITION OF TERMS AS APPLIED TO SUBSTANCES OF VEGETABLE ORIGIN.

Alkaloids.—(Their English names terminating in *ine*, their Latin names terminating in *ina*.) Compounds of carbon, hydrogen and nitrogen, and usually containing also oxygen, either existing in the plant as proximate principles, or being derived from other alkaloids, having basic properties, and forming salts, usually crystallizable, with acids, without displacing any of the hydrogen of the latter. The chief characters are as follows:

(1) Either
- (*a*) solid, mostly crystalline and colorless, non-volatile, or
- (*b*) liquid and volatile.

(2) They turn red litmus paper blue.

(3) They are soluble in alcohol, chloroform, petroleum benzin, benzene, and often in ether. They are insoluble in water, but not so their salts, while the latter are insoluble in chloroform, ether, petroleum benzin and benzene.

(4) They are usually precipitated from saline solution by alkalies.

(5) One or more of the following will precipitate them: tannic, phosphomolybdic or picric acid, potassio-mercuric iodide, or auric chloride.

(6) Their solutions are usually intensely bitter.

Alkaloids are, as a class, the most energetic and important medicinal constituents of plants. Examples in U. S. P.: Atropine, Morphine, Strychnine.

Glucosides.—(Their English names terminating in *in*, their Latin names terminating in *inum*.) Bodies which, heated with a diluted mineral acid and water, or by the action of a ferment, split up into glucose and some other substances (alcohols, aldehydes, phenols). Examples in U. S. P.: Salicinum, Strophanthinum.

Amaroids or Bitter Principles (their names ending in *in* and *inum* as above) are of such varied nature that they do not admit of any chemical diagnosis. The term includes all distinctly bitter extractives of definite chemical composition other than alkaloids and glucosides.

Glucosides and Amaroids are not the only principles whose names end in *in*.

Fixed Oils are esters of the higher fatty acids which at ordinary temperatures remain liquid. The fatty acids commonly entering into the composition of fixed oils are oleic, palmitic, and stearic.

Example: Olive oil consists of a mixture of a combination of oleic acid ($C_{18}H_{34}O_2$) with glyceryl (C_3H_5) and palmitic acid ($C_{16}H_{32}O_2$) with glyceryl. In it there is thus a mixture of two oils having the formulæ $C_3H_5(C_{18}H_{33}O_2)_3$ and $C_3H_5(C_{16}H_{31}O_2)_3$ respectively. When acted upon by caustic alkalies or metallic oxides, these form soaps (oleates, palmitates, or stearates of metals) and glycerin. This process is called saponification, *e. g.*,

$$C_3H_5(C_{18}H_{33}O_2)_3 + 3NaOH = 3NaC_{18}H_{33}O_2 \text{ (Sodium Oleate)}.$$
$$+ C_3H_5(OH)_3 \text{ (Glycerin)}.$$

Fixed oils are obtained by expression or by boiling with water and skimming off the melted oil, from the fruits or seeds of plants, or from animal tissues. When pure they are usually colorless or pale yellow; they float on water and cause a greasy mark on paper. With very few exceptions they are liquid at ordinary temperatures. They are termed fixed because they cannot be distilled without decomposition. They are soluble in ether, chloroform, turpentine and volatile oils.

Those in U. S. P. are Oleum Amygdalæ Expressum, Gossypii Seminis, Lini, Morrhuæ, Olivæ, Ricini, and Tiglii.

Fats are fixed oils which are solid at ordinary temperatures; if extracted by expression, sufficient heat to melt them must be used.

Examples in U. S. P.: Oleum Theobromatis, Adeps.

The same definitions will apply to fixed oils and fats of animal origin.

Waxes are chiefly composed of fatty acids combined with monohydric alcohols homologous with methyl alcohol. They contain no glyceryl, however, and are brittle at low temperatures.

Volatile or Essential Oils are those peculiar principles to which, in a majority of instances, the odor of plants is due. They do not all pre-exist in the plant; some being the result of fermentative action between certain constituents of the latter, and others being produced by destructive distillation. They do not leave a greasy mark on paper, and resemble fixed oils only in being soluble in the same media. They are mostly inflammable, and mostly lighter than water. They are highly odorous and aromatic, and sufficiently soluble in water to impart their odor and taste to it. Most are prepared by distillation—that is, by passing a current of steam through the substance from which they are extracted; the steam is condensed, and the oil either floats to the top or sinks to the bottom of the water. A few, as oil of lemon, are obtained by expression. Their composition varies greatly, and they are of four classes:

(*a*) **Terpenes,** which consist of carbon and hydrogen; *e. g.*, Oil of turpentine.

(*b*) **Oxygenated,** containing oxygen; *e. g.*, Oil of eucalyptus.

(*c*) **Sulphurated,** containing sulphur; *e. g.*, Volatile oil of mustard.
(*d*) **Nitrogenated,** containing nitrogen; *e. g.*, Oil of bitter almond.

They may contain aldehydes, phenol derivatives, ethers or ethereal salts, alcohols or ketones, generally associated with terpenes of varying composition.

Resins are of very indefinite composition. They are among the products of oxidation of volatile oils, being usually oxidized terpenes. They are solid, mostly uncrystallizable, fusible, not volatile, combustible, insoluble in water, mostly soluble in alkalies and volatile oils, and also in one or more of the following: alcohol, ether, chloroform, and fixed oils. Since they are insoluble in water, but not in alcohol, they may be prepared by extraction with alcohol and precipitation with water. This is the reason for the precipitate which falls when water is added to a resinous tincture. Those which combine with alkalies form resin soaps. Hence the alkali in Tinctura Guaiaci Ammoniata, and Tinctura Valerianæ Ammoniata. When occurring naturally, there are usually two or more resins mixed.

The U. S. P resins are Resina Jalapæ, Podophylli, and Scammonii, and Mastiche.

Oleoresins are natural solutions of resins in volatile oils.

Those in the U. S. P. are Oleoresina Aspidii, Capsici, Cubebæ, Lupulini, Piperis, and Zingiberis.

Balsam is a term used in several different ways. As to the U. S. P. articles, they are liquid or soft products containing resin, an odorous principle, and benzoic, or cinnamic acids, or both.

Those in the U. S. P. are Balsamum Peruvianum and Tolutanum, Benzoinum and Styrax.

Resins containing benzoic or cinnamic acids are sometimes called solid balsams.

Gums are exudations from plants, having an insipid taste, insoluble in ether and alcohol, and in water either dissolving to form a mucilage or swelling to form an adhesive jelly. They consist of one or more of the following:

(*a*) Arabin or soluble gums, *e. g.*, Acacia.
(*b*) Bassorin or partially soluble gums, *e. g.*, Tragacantha.
(*c*) Cerasin or insoluble gum.

Solutions of gum are precipitated by alcohol.

Gum-resins are exudations from plants consisting of a mixture of one or more gums and one or more resins. When they are rubbed with water the gum dissolves and the resin remains mechanically suspended in the solution, forming an emulsion.

The U. S. P. gum-resins are Asafœtida, Cambogia, Myrrha and Scammonium.

PHARMACEUTICAL PROCESSES.

Many of these, as filtration, precipitation, etc., need no explanation, but the following require a few words.

Carbonization is the heating of organic substances without exposure to the air until the volatile constituents are driven off and the residue assumes the characteristic appearance of carbon.

Clarification is a process for making liquids transparent by separating from them, without the use of filters or strainers, such solid substances as render them cloudy or turbid. It is most commonly effected by the application of heat, though filtration or decantation must always be subsequently resorted to for removing the separated matter. Other means employed for clarifying are: By increasing the fluidity of the liquid, by the use of egg-albumin, gelatin, milk, or paper-pulp, by subsidence through long standing (often applied to fixed oils), and by fermentation (as in the case of fruit juices).

Comminution is the process of reducing drugs to particles, or breaking up their state of aggregation. It is effected by cutting, slicing, chopping, the use of drug-mills, etc.

Decoloration of liquids is usually effected through the agency of animal charcoal.

Dialysis.—The process of separating crystalloids from colloids by bringing them, in a mixed solution, into contact with one side of a membrane, such as a bladder, parchment or parchment paper, which has water in contact with its other side, and result-

ing in the passage into the water of the crystalloid to form the "diffusate," the remainder constituting the "dialysate."

Displacement.—Another name for Percolation.

Elutriation is a process for obtaining a substance in fine powder by diffusing an insoluble powder in water. The larger and heavier particles having sunk to the bottom of the vessel, the supernatant fluid is decanted into another vessel, where the lighter particles are collected. The process may be repeated, if necessary. To facilitate the drying of the powder thus obtained, the soft mass, or **magma,** after having been drained, may be formed into small conical masses on warm porous tiles. Prepared chalk is an example of an elutriated powder.

Expression is the forcible separation of liquids from solids by means of pressure. Hand-pressure through straining-cloths may be employed, but mechanical processes are more efficient.

Fusion is the process of liquefying solid bodies by the application of heat, as in the melting of wax and the preparation of moulded silver nitrate.

Granulation is a process by which certain substances soluble in water are obtained in the form of coarse powder by simple evaporation of their solution, with constant stirring, until all moisture is dissipated.

Levigation consists in reducing a drug to powder by triturating it with a little water and drying the resulting paste.

Lixiviation is the practice of exhausting substances which have been incinerated, as, for instance, wood-ashes, of their soluble constituents by pouring water upon them after their introduction into a conical-shaped vessel; the resulting solution being called a "lye."

Maceration.—The extraction of the soluble portions of a substance which is not wholly soluble in the menstruum, by prolonged contact therewith.

Massing.—The most important step in the preparation of pills is the formation of a proper mass, which should consist of a firm, consistent paste, sufficiently plastic to admit of being moulded without adhering to the moulds and sufficiently firm to prevent

the pills from losing shape. Some substances, such as gums and resinous drugs, possess the requisite adhesiveness in themselves, but need the addition of a liquid—water or alcohol—in order to develop it. Others have no inherent adhesive properties, and with them it becomes necessary to impart tenacity by the addition of some liquid or solid material, which is called the **excipient.** Excipients must be added judiciously, so that the constituents of the mass may not be [illegible] action or the bulk be unnecessarily increased; [illegible] dition the mass should be well kneaded. In ord[illegible] geneity of the mass, and also the subsequent ac[illegible] doses, all the constituents should, whenever poss[illegible] to a fine powder. Small quantities of potent re[illegible] kaloids, narcotic extracts, etc., are preferably tri[illegible] ttle sugar of milk before mixing them with th[illegible] ts, to facilitate uniform distribution.

Percolation.—The extraction in a suitable vessel (the "percolator") of the soluble constituents of a powder by the descent through it of a solvent (the "menstruum"), the resulting solution being called the "percolate." The **marc** is the material after its exhaustion by maceration or percolation. Percolation enters into the manufacture of a great majority of the official preparations of organic drugs.

Repercolation consists in using the liquid obtained by a substance as the menstruum for percolating a second portion of the same substance, and using the liquid from this second percolation as a menstruum for percolating a third portion of the same substance, and so on as often as may be desired.

Pulverization is the reduction of a substance by mechanical means to fine particles. Like *grinding*, applied to the production of coarse particles, it is very largely carried on by drug-millers. Before pulverizing, a substance must be dried, and the desired fineness of the powder determines the character of the preliminary treatment. Thus, drugs containing volatile oils are apt to be rendered worthless if they are dried sufficiently to enable them to be ground very finely, and hence they are preferred when

coarsely powdered. In recent years an important change in pharmaceutical practice in this respect has been effected, and preparations in which very fine powders were once directed are now ordered to be made from coarse powders. The processes for extracting the soluble principles having been very greatly improved, the necessity no longer exists for using the very fine powders, and therefore the volatile principles are not sacrificed. *Pulverization by intervention* is the process of reducing substances to powder through the use of a foreign substance, from which the powder is subsequently freed by some simple method.

Scaling.—Scale preparations are made by drying concentrated solutions of drugs on glass plates; after which the solid film thus left is broken up. Some preparations of iron are obtained by scaling.

Separation of liquids which do not mix with each other is a mechanical process accomplished with pipettes or with funnels having stop-cocks in their necks. Special forms of receivers are used for the separation of volatile oils from the water accompanying them during distillation.

Solution.—Solution is the process by which a solid, gaseous, or liquid substance, when brought into contact with a liquid, becomes molecularly blended with it in such a way that a permanent homogeneous fluid results; and the resulting fluid is known as a solution. The liquid employed for effecting solution is termed a *solvent* or **menstruum.** In cases where it is incapable of entirely dissolving a substance the solution is called a *saturated* one when all of the substance that is possible for it to dissolve has been taken up. A substance which altogether resists solution is said to be **insoluble.** The fact should be noted that when certain solids are brought together by means of trituration, solutions result. This effect is seen, for instance, when camphor is rubbed up with menthol or with hydrated chloral. Solution is facilitated by agitation, and in most cases by the application of heat. Solution may be either **simple** or **chemical.** In the first the substance dissolved undergoes no change except as regards its physical condition. In chemical solution more or less altera-

tion occurs in the properties of both the solvent and the substance dissolved.

Standardizing.—Specifying an upper or lower limit, or both, of the active constituent which a drug or its preparation must contain in order to be official, and prescribing an appropriate process for its determination. Satisfactory processes for standardizing are extremely difficult to establish, but have been adopted for the following:

Acidum Sulphurosum, not less than 6 per cent., by weight, of sulphur dioxide.

Aconitum, not less than 0.5 per cent. of aconitine.

Amylis Nitris, about 80 per cent. of amyl (chiefly iso-amyl) nitrite.

Aqua Hydrogenii Dioxidi, about 3 per cent., by weight, of absolute hydrogen dioxide, corresponding to about 10 volumes of available oxygen.

Belladonnæ Folia, not less than 0.3 per cent. of mydriatic alkaloids.

Belladonnæ Radix, not less than 0.45 per cent. of mydriatic alkaloids.

Benzaldehydum, not less than 85 per cent. of pure benzaldehyde.

Cinchona, not less than 5 per cent. of anhydrous cinchona alkaloids, and at least 4 per cent. of anhydrous ether-soluble alkaloids.

Cinchona Rubra, not less than 5 per cent. of anhydrous cinchona alkaloids.

Cinnaldehydum, not less than 95 per cent. of pure cinnamic aldehyde.

Coca, not less than 0.5 per cent. of the ether-soluble alkaloids of coca.

Colchici Cormus, not less than 0.35 per cent. of colchicine.

Colchici Semen, not less than 0.45 per cent. of colchicine.

Conium, not less than 0.5 per cent. of coniine.

Emplastrum Belladonnæ, not less than 0.38 per cent., nor more than 0.42 per cent., of mydriatic alkaloids.

Extractum Belladonnæ Foliorum, 1.4 per cent. of mydriatic akaloids.

Extractum Colchici Cormi, 1.4 per cent. of colchicine.

Extractum Hyoscyami, 0.3 per cent. of mydriatic alkaloids.

Extractum Nucis Vomicæ, 5 per cent. of strychnine.

Extractum Opii, 20 per cent. of morphine.

Extractum Physostigmatis, 2 per cent. of ether-soluble alkaloids.

Extractum Scopolæ, 2 per cent. of mydriatic alkaloids.

Extractum Stramonii, 1 per cent. of mydriatic alkaloids.

Ferri et Quininæ Citras, not less than 11.5 per cent. of dried quinine and ferric citrate corresponding in amount to not less than 13.5 per cent. of metallic iron.

Ferri et Strychninæ Citras, not less than 0.9 per cent. nor more than 1 per

cent., of strychnine, and ferric citrate corresponding in amount to not less than 16 per cent. of metallic iron.

Ferrum Reductum, not less than 90 per cent. of pure metallic iron.

Fluidextractum Aconiti, 0.4 gm. of aconitine in 100 c.c.

Fluidextractum Belladonnæ Radicis, 0.4 gm. of mydriatic alkaloids from belladonna root in 100 c.c.

Fluidextractum Cinchonæ, 4 gm. of anhydrous ether-soluble alkaloids from cinchona in 100 c.c.

Fluidextractum Cocæ, 0.5 gm. of ether-soluble alkaloids from coca in 100 c.c.

Fluidextractum Colchici Seminis, 0.4 gm. of colchicine in 100 c.c.

Fluidextractum Conii, 0.45 gm. of coniine in 100 c.c.

Fluidextractum Guaranæ, 3.5 gm. of the alkaloids from guarana in 100 c.c.

Fluidextractum Hydrastis, 2 gm. of hydrastine in 100 c.c.

Fluidextractum Hyoscyami, 0.075 gm. of the alkaloids from hyoscyamus in 100 c.c.

Fluidextractum Ipecacuanhæ, 1.5 gm. of the alkaloids from ipecac in 100 c.c.

Fluidextractum Nucis Vomicæ, 1 gm. of strychnine in 100 c.c.

Fluidextractum Pilocarpi, 0.4 gm. of the alkaloids from pilocarpus in 100 c.c.

Fluidextractum Scopolæ, 0.5 gm. of the mydriatic alkaloids from scopola in 100 c.c.

Fluidextractum Stramonii, 0.25 gm. of the mydriatic alkaloids from stramonium in 100 c.c.

Guarana, not less than 3.5 per cent. of its alkaloidal principles.

Hydrastis, not less than 2.5 per cent. of hydrastine.

Hyoscyamus, not less than 0.08 per cent. of mydriatic alkaloids.

Iodine, not less than 99 per cent. of pure iodine.

Ipecacuanha, not less than 1.75 per cent. of ipecac alkaloids.

Jalapa, not less than 7 per cent. of total resin, of which not more than 15 per cent. should be soluble in ether.

Liquor Formaldehydi, not less than 37 per cent., by weight, of absolute formaldehyde.

Nux Vomica, not less than 1.25 per cent. of strychnine.

Oleum Amygdalæ Amaræ, not less than 85 per cent. of benzaldehyde, and not less than 2 per cent., nor more than 4 per cent., of hydrocyanic acid.

Oleum Cajuputi, not less than 55 per cent., by volume, of cineol.

Oleum Caryophyli, not less than 80 per cent., by volume, of eugenol.

Oleum Cinnamoni, not less than 75 per cent., by volume, of cinnamic aldehyde.

Oleum Eucalypti, not less than 50 per cent., by volume, of cineol (eucalyptol).

Oleum Limonis, not less than 4 per cent. of aldehyde, calculated as citral.

Oleum Menthæ Piperitæ, not less than 8 per cent. of ester, calculated as menthyl acetate, and not less than 50 per cent. of total menthol (free and as ester).

Oleum Pimentæ, not less than 65 per cent., by volume, of eugenol.

Oleum Rosæ, a saponification value of not less than 10 nor more than 17.

Oleum Rosmarini, not less than 5 per cent. of ester, calculated as bornyl acetate, and not less than 15 per cent. of total borneol.

Oleum Santali, not less than 90 per cent. of alcohols, calculated as santalol.

Oleum Sinapis Volatile, not less than 92 per cent. of allyl iso-thyocyanate.

Oleum Thymi, not less than 20 per cent., by volume, of phenols.

Opii Pulvis, not less than 12 per cent. nor more than 12.5 per cent. of crystallized morphine.

Opium, not less than 9 per cent. of crystallized morphine.

Opium (in its normal, moist condition), not less than 9 per cent. of crystallized morphine.

Opium Deodoratum, not less than 12 per cent. nor more than 12.5 per cent. of crystallized morphine.

Opium Granulatum, not less than 12 per cent. nor more than 12.5 per cent. of crystallized morphine.

Pancreatinum, capable of converting not less than 25 times its own weight of starch into substances soluble in water.

Pepsinum, capable of digesting not less than 3000 times its own weight of freshly coagulated and disintegrated egg albumin.

Phenol, not less than 96 per cent. of absolute phenol.

Physostigma, not less than 0.15 per cent. of alkaloids soluble in ether.

Pilocarpus, not less than 0.5 per cent. of alkaloids.

Scopola, not less than 0.5 per cent. of its alkaloids.

Spiritus Ætheris Nitrosi, not less than 4 per cent. of ethyl nitrite.

Spiritus Ammoniæ, 10 per cent., by weight, of ammonia gas.

Stramonium, not less than 0.25 per cent. of mydriatic alkaloids.

Tinctura Aconiti, 0.045 gm. of aconitine in 100 c.c.

Tinctura Belladonnæ Foliorum, 0.03 gm. of the alkaloids from belladonna leaves in 100 c.c.

Tinctura Cinchonæ, 0.75 gm. of anhydrous ether-soluble alkaloids of cinchona in 100 c.c.

Tinctura Colchici Seminis, 0.04 gm. of colchicine in 100 c.c.

Tinctura Hydrastis, 0.4 gm. of hydrastine in 100 c.c.

Tinctura Hyoscyami, 0.007 gm. of mydriatic alkaloids in 100 c.c.

Tinctura Nucis Vomicæ, 0.1 gm. of strychnine in 100 c.c.

Tinctura Opii, not less than 1.2 nor more than 1.25 gm. of crystallizable morphine in 100 c.c.

Tinctura Opii Deodorati, not less than 1.2 nor more than 1.25 gm. of crystallized morphine in 100 c.c.

Tinctura Physostigmatis, 0.014 per cent. of the ether-soluble alkaloids from physostigma, in 100 c.c.

Tinctura Stramonii, 0.025 gm. of mydriatic alkaloids from stramonium in 100 c.c.

For the following, Volumetric Assays are directed by the Pharmacopœia:

	Percentage Strength of Product.
Acidum Aceticum	36.0 absolute acid.
Acidum Aceticum Dilutum	6.0 absolute acid.
Acidum Aceticum Glaciale	99.0 absolute acid.
Acidum Boricum	99.8 pure acid.
Acidum Citricum	99.5 pure acid.
Acidum Hydriodicum Dilutum	10.0 absolute acid.
Acidum Hydrobromicum Dilutum	10.0 absolute acid.
Acidum Hydrochloricum	31.9 absolute acid.
Acidum Hydrochloricum Dilutum	10.0 absolute acid.
Acidum Hydrocyanicum Dilutum	2.0 absolute acid.
Acidum Hypophosphoricum	30.0 absolute acid.
Acidum Hypophosphoricum Dilutum	10.0 absolute acid.
Acidum Lacticum	75.0 absolute acid.
Acidum Nitricum	68.0 absolute acid.
Acidum Nitricum Dilutum	10.0 absolute acid.
Acidum Phosphoricum	85.0 absolute acid.
Acidum Phosphoricum Dilutum	10.0 absolute acid.
Acidum Sulphuricum	92.5 absolute acid.
Acidum Sulphuricum Aromaticum	20.0 absolute acid.
Acidum Sulphuricum Dilutum	10.0 absolute acid.
Acidum Sulphurosum	6.0 SO_2.
Acidum Tartaricum	99.5 pure acid.
Acidum Trichloraceticum	98.8 absolute acid.
Aconitum	0.5 aconitine.
Ammonii Bromidum	97.0 pure salt.
Ammonii Carbonas	97.0 pure salt.
Ammonii Chloridum	99.5 pure salt.
Antimonii et Potassii Tartras	99.5 pure salt.
Aqua Ammoniæ	10.0 NH_3.
Aqua Ammoniæ Fortior	28.0 HN_3.
Aqua Hydrogenii Dioxidi	3.0 H_2O_2.
Argenti Nitras	99.0 pure salt.
Argenti Nitras Fusus	94.8 $AgNO_3$.

	Percentage Strength of Product.
Argenti Nitras Mitigatus	33.3 $AgNO_3$.
Arseni Iodidum	82.7 iodine. 16.3 metallic arsenic.
Arseni Trioxidum	99.8 As_2O_3.
Belladonnæ Folia	0.3 alkaloids.
Belladonnæ Radix	0.45 alkaloids.
Benzaldehydum	85.0 C_7H_6O.
Calx Chlorinata	30.0 chlorine.
Chromii Trioxidum	90.0 CrO_3.
Cinnaldehydum	95.0 C_9H_8O.
Coca	0.5 ether-soluble alkaloids.
Emplastrum Belladonnæ	0.38 to 0.42 alkaloids.
Extractum Belladonnæ Foliorum	1.4 alkaloids.
Extractum Hyoscyami	0.3 alkaloids.
Extractum Nucis Vomicæ	5.0 strychnine.
Extractum Physostigmatis	2.0 ether-soluble alkaloids.
Extractum Scopolæ	2.0 alkaloids.
Extractum Stramonii	1.0 alkaloids.
Ferri Carbonas Saccharatus	15.0 $FeCO_3$.
Ferri Chloridum	22.0 metallic iron.
Ferri Citras	16.0 metallic iron.
Ferri et Ammonii Citras	16.0 metallic iron.
Ferri et Ammonii Sulphas	11.5 metallic iron.
Ferri et Ammonii Tartras	13.0 metallic iron.
Ferri et Potassii Tartras	15.0 metallic iron.
Ferri et Quininæ Citras	13.5 metallic iron.
Ferri et Quininæ Citras Solubilis	13.5 metallic iron.
Ferri et Strychninæ Citras	16.0 metallic iron.
Ferri Phosphas Solubilis	12.0 metallic iron.
Ferri Pyrophosphas Solubilis	10.0 metallic iron.
Ferri Sulphas (cryst. and gran.)	99.5 pure crystals.
Ferrum Reductum	90.0 metallic iron.
Fluidextractum Aconiti	0.4 gm. aconitine in 100 c.c.
Fluidextractum Belladonnæ Radicis	0.4 gm. alkaloids in 100 c.c.
Fluidextractum Cocæ	0.5 ether-soluble alkaloids in 100 c.c.
Fluidextractum Hyoscyami	0.075 alkaloids in 100 c.c.
Fluidextractum Ipecacuanhæ	1.5 alkaloids in 100 c.c.
Fluidextractum Nucis Vomicæ	1.0 gm. strychnine in 100 c.c.
Fluidextractum Pilocarpi	0.4 gm. alkaloids in 100 c.c.
Fluidextractum Scopolæ	0.5 gm. alkaloids in 100 c.c.
Fluidextractum Stramonii	0.25 gm. alkaloids in 100 c.c.

	Percentage Strength of Product.
Hyoscyamus	0.08 alkaloids.
Iodum	99.0 iodine.
Ipecacuanhæ	1.75 ipecac alkaloids.
Liquor Acidi Arsenosi	1.0 As_2O_3.
Liquor Calcis	0.14 $Ca(OH)_2$.
Liquor Ferri Chloridi	10.0 metallic iron.
Liquor Ferri Subsulphatis	13.57 metallic iron.
Liquor Ferri Tersulphatis	10.0 metallic iron.
Liquor Formaldehydi	37.0 CH_2O.
Liquor Iodi Compositus	5.0 iodine.
Liquor Plumbi Subacetatis	25.0 basic salt.
Liquor Potassii Arsenitis	1.0 As_2O_3.
Liquor Potassii Citratis (to be ignited)	8.0 $K_3C_6H_5O_7$.
Liquor Potassii Hydroxidi	5.0 KOH.
Liquor Sodæ Chlorinatæ	2.4 chlorine.
Liquor Sodii Hydroxidi	5.0 NaOH.
Lithii Bromidum	97.0 pure salt.
Lithii Carbonas	98.5 pure salt.
Magnesii Carbonas (to be ignited)	38.4 MgO.
Magnesii Oxidum (to be ignited)	96.0 MgO.
Magnesii Oxidum Ponderosum (*see* Magnesii Oxidum).	
Mangani Dioxidum Præcipitatum	80.0 MnO_2.
Nux Vomica	1.25 strychnine.
Oleum Amygdalæ Amaræ	85.0 benzaldehyde.
Oleum Amygdalæ Amaræ	2.0 to 4.0 HCN.
Oleum Limonis	4.0 citral.
Oleum Menthis Piperitæ	8.0 menthyl acetate.
Oleum Menthis Piperitæ	50.0 total menthol.
Oleum Rosmarini	5.0 bornyl acetate.
Oleum Santali	9.0 santalol.
Oleum Sinapis Volatile	92.0 iso-thiocyanate.
Phenol	96.0 pure phenol.
Physostigma	0.15 ether-soluble alkaloids.
Pilocarpus	0.5 alkaloids.
Potassii Acetas (to be ignited)	98.0 pure salt.
Potassii Bicarbonas	99.0 pure salt.
Potassii Bitartras (to be ignited)	99.0 pure salt.
Potassii Bromidum	97.0 pure salt.
Potassii Carbonas (after drying)	98.0 pure salt.
Potassii Citras (to be ignited)	99.0 pure salt.
Potassii Cyanidum	95.0 pure salt.

	Percentage Strength of Product.
Potassii et Sodii Tartras (to be ignited)	99.0 pure salt.
Potassii Hydroxidum	85.0 KOH.
Potassii Iodidum	99.0 pure salt.
Potassii Permanganas	99.0 $KMnO_4$.
Scopola	0.5 alkaloids.
Sodii Acetas (to be ignited)	99.5 pure salt.
Sodii Benzoas (to be ignited)	99.0 pure salt.
Sodii Bicarbonas	99.0 pure salt.
Sodii Bisulphis	90.0 pure salt.
Sodii Bromidum	97.0 pure salt.
Sodii Carbonas Monohydratus	85.0 anhydrous salt.
Sodii Chloridum	99.0 pure salt.
Sodii Citras (to be ignited)	97.0 pure salt.
Sodii Hydroxidum	90.0 NaOH.
Sodii Iodidum	98.0 pure salt.
Sodii Nitris	90.0 pure salt.
Sodii Salicylas (to be ignited)	99.5 pure salt.
Sodii Sulphis	94 pure salt.
Sodii Thiosulphas	98.0 pure salt.
Spiritus Ammoniæ	10.0 NH_3.
Strontii Bromidum	97.0 pure salt.
Strontii Iodidum	98.0 pure salt.
Sulphuris Iodidum	about 80.0 iodine.
Syrupus Acidi Hydriodici	1.0 HI.
Syrupus Ferri Iodidi	5.0 FeI_2.
Tinctura Aconiti	0.045 aconitine in 100 c.c.
Tinctura Belladonnæ Foliorum	0.03 alkaloids in 100 c.c.
Tinctura Ferri Chloridi	4.58 metallic iron.
Tinctura Hyoscyami	0.007 gm. alkaloids in 100 c.c.
Tinctura Iodi	6.86 gm. iodine in 100 c.c.
Tinctura Physostigmatis	0.014 gm. ether-soluble alkaloids in 100 c.c.
Tinctura Stramonii	0.25 gm. alkaloids in 100 c.c.
Vinum Album	0.45 to 0.77 acid.
Vinum Rubrum	0.45 to 0.77 acid.
Zinci Bromidum	97.0 pure salt.
Zinci Iodidum	98.0 pure salt.
Zinci Oxidum	99 ZnO.

Sublimation is the process of separating a volatile solid substance from one which is not volatile by the application of heat. The product is termed a *sublimate.* The objects of sublimation

are: (1) to purify volatile solids from admixed and fixed impurities, and (2) to provide a convenient means of collecting volatile solids resulting from chemical reaction at high temperatures.

Trituration is the process of reducing substances to fine particles by continued attrition in a mortar. When the substance is rubbed with sugar of milk, which is an inert and gritty powder, the product is designated a *trituration*.

WEIGHTS, MEASURES, AND SYMBOLS.

Weights (Apothecaries' or Troy weight).

1 grain		symbol gr.
480 grains	= one OUNCE	symbol ℥
12 ounces	= one POUND	symbol lb.

The scruple (20 grains, symbol ℈) is rarely used, and the drachm (60 grains, symbol ʒ) is commonly used.

Measures of Capacity.

1 minim		symbol, ♏
60 minims	= one FLUID DRACHM	symbol, ʒ
8 fluid drachms	= one FLUID OUNCE	symbol, ℥
16 fluid ounces	= one PINT	symbol, O
8 pints	= one GALLON	symbol, C

Usually ʒ and ℥ are written fl ʒ and fl ℥ when they stand for fluid drachms and fluid ounces.

Relations of Measures to Weights.

1 minim	is the measure of	0.95 grains of water.
1 fluid drachm	is the measure of	56.96 grains of water.
1 fluid ounce	is the measure of	455.69 grains of water.
1 pint	is the measure of	7291.04 grains of water.

A 1 per cent. solution is approximately a grain in 110 minims.

A fluid grain is the volume of one grain of water at 15.5° C.; 60° F., that is to say, it is a little over a minim (1.05 ♏).

In the pharmacopœial description of the various proportions which several parts of a compound bear to one another, the word parts means parts by weight; the term fluid parts signifies the volume of an equal number of parts of water.

Metrical System.—This, which is as follows, is official in the U. S. P. for the making of drugs and preparations.

WEIGHTS.

1 milligramme = 0.001 gramme.
1 centigramme = 0.01 gramme.

1 decigramme =0.1 gramme.
1 gramme =weight of 1 cubic centimetre of distilled water at 4° C.; 39.2° F. Abbreviation, gm.
1 dekagramme = 10.0 grammes.
1 hektogramme = 100.0 grammes.
1 kilogramme =1000.0 grammes. Abbreviation, kilo.

MEASURES.

1 millilitre= 1 cubic centimetre (abbreviation, c.c.)=the measure of 1 gm. of water.
1 centilitre= 10 c.c.=the measure of 10 gm. of water.
1 decilitre = 100 c.c.=the measure of 100 gm. of water.
1 litre =1000 c.c.=the measure of 1000 gm. (1 kilo of water).

Conversion of United States to Metrical System.

WEIGHTS.

1 grain = 0.0648 gm.
1 ounce = 31.103 gm.
1 pound =373.250 gm.

MEASURES.

1 minim = 0.0616 c.c.
1 fluid drachm = 3.75 c.c.
1 fluid ounce = 29.57 c.c.
1 pint = 473.18 c.c.
1 gallon =3785.43 c.c.

Conversion of Metrical to United States Weights and Measures.

WEIGHTS.

1 milligramme = 0.015432 grain.
1 gramme = 15.43235 grains.
1 kilogramme =15432.356 grains.

MEASURES.

1 cubic centimetre =16.23 minims.
1 litre (1000 c.c.) =33.81 fluid ounces.

In prescribing on the Continent of Europe all liquids are weighed.

The weight used for liquids and solids is grammes, and this word is not expressed. Thus—

Magnesii sulphas 20.0 = 20 grammes of magnesium sulphate.
Hydrargyri chloridum mite 0.5 = half a gramme of mild mercurous chloride.
Tinctura rhei 1.5 = a gramme and a half of tincture of rhubarb.

Domestic Measures.

A TEA-SPOONFUL is about a fluid drachm (4 c.c.). Usually more, viz., nearly 5 c.c.

A DESSERT-SPOONFUL is about two fluid drachms (8 c.c.).

A TABLE-SPOONFUL is about half a fluid ounce (16 c.c.). Usually it is about 20 c.c.

A WINE-GLASSFUL is about one and a half to two fluid ounces (45 to 60 c.c.).

A TEA-CUPFUL is about five fluid ounces (150 c.c.).

A BREAKFAST-CUPFUL is about eight fluid ounces (240 c.c.).

A TUMBLERFUL is about eleven fluid ounces (330 c.c.).

A DROP is often taken as being a minim, but drops vary so much in size that they should never be used for children, nor as a measure of powerful drugs. For example, the number of drops in a fluid drachm of the official Syrup of Acacia is 44, of Water 60, of Alcohol 146, of Chloroform 250.

Spoons, glasses and cups vary so much in capacity that it is never safe to prescribe solutions of powerful drugs to be measured by them. The use of glass graduates, which can be obtained accurately marked, should be insisted upon.

PHARMACOPŒIAL PREPARATIONS AND THEIR DOSES.

Most drugs are not, in their natural state, suitable for administration. They are either too bulky, too nauseous, or contain noxious principles. Preparations suitable for administration are, therefore, prepared from them according to "official" pharmacopœial directions. The doses of the various official drugs and their preparations which may safely be administered to an adult are those given in the last edition of the United States Pharmacopœia. These doses are intended to be "the average approximate (but neither a minimum nor a maximum) dose for adults." But these doses are often not rigorously adhered to in prescribing, because they vary with the purpose for which the drug is required and the age of the patient. The following is an account of the preparation of the pharmacopœial preparations, and the attempt has been made to arrange the doses so as to make them easy of remembrance.

Unless otherwise specified, the preparations are for internal use.

Aceta (Vinegars).—Liquid preparations resulting from the extraction of the drug with dilute acetic acid, and filtering. The U. S. P. contains:

	Dose.
Acetum Opii	0.5 c.c. (8 ♏).
Acetum Scillæ	1. c.c. (15 ♏).

Aquæ (Waters).—Preparations made by impregnating water

with a volatile substance. This is often done by triturating the substance with purified talc and filtering. Those in the U. S. P. thus made are:

	Dose.
Aqua Camphoræ	8 c.c. (2 fl. dr.).
—Anisi	16 c.c. (4 fl. dr.).
—Cinnamomi	
—Fœniculi	
—Menthæ Piperitæ	
—Menthæ Viridis	

Two are made by distillation:

	Dose.
Aqua Destillata	indeterminate.
—Hamamelidis	8 c.c. (2 fl. dr.).

Eight are simple solutions in distilled water:

	Dose.
Aqua Hydrogenii Dioxidi	4 c.c. (1 fl. dr.).
—Amygdalæ Amaræ	
—Aurantii Florum Fortior	8 c.c. (2 fl. dr.).
—Creosoti	
—Rosæ Fortior	
—Aurantii Florum	16 c.c. (4 fl. dr.).
—Chloroformi	
—Rosæ	

Two are made by passing gases through water:

	Dose.
Aqua Ammoniæ Fortior.	
—Ammoniæ	1 c.c. (15 ♏).

Cataplasmata (Poultices).—Soft, pasty masses used as a medium for the external and local application of a moist heat, with or without the addition of active medicaments. Any bland substance which will retain its heat and moisture for a long time is applicable for this purpose, a little oil or glycerin being often added to prevent caking. The substances chiefly used are kaolin, flax-seed, elm bark, bran and oatmeal.

To make a poultice properly, the bowl in which it is mixed, the water, and the spatula for mixing and spreading the flannel or

cheese-cloth on which it is laid, must all be as hot as possible. The material should be added gradually to the boiling water, which is continually stirred. It should not be spread so thick as to make it inconveniently heavy.

One cataplasm is official in the U. S. P.:

Cataplasma Kaolini.

Cerata (Cerates).—Adhesive preparations for external use, containing wax, capable of being spread at ordinary temperatures, and not melting at the temperature of the body. Six are official in the U. S. P.:

Ceratum —Camphoræ	Ceratum Cantharidis —Resinæ	Ceratum Resinæ Compositum —Plumbi Subacetatis

Chartæ (Papers).—Non-absorbent papers coated with plaster-like preparations and used like plasters. The U. S. P. contains one:

Charta Sinapis, made from mustard.

Collodia (Collodions).—Preparations for external use, either simple collodion (a solution of pyroxylin in ether and alcohol) or collodion impregnated with an active substance. When applied externally a protective film is formed, owing to the rapid volatilization of the solvent. The U. S. P. contains four :

Collodium.	Collodium Flexile.
Collodium Cantharidatum.	—Stypticum.

Confectiones (Confections).—*Synonym.*—Electuaries. In England also called Boluses or Conserves. Permanent pasty preparations of powdered drugs thoroughly triturated with syrup or honey. The U. S. P. contains two:

Confectio Rosæ, used as a basis for pills.
—Sennæ ..... dose, 4 gm. (60 grains).

Decocta (Decoctions).—Liquid preparations of organic drugs, 50 grammes of drug to 1000 c.c. of decoction, unless otherwise specified by the physician; made by boiling the drug, coarsely comminuted, for fifteen minutes in 1000 c.c. of water, straining the resulting liquid, and adding sufficient cold water to secure

the required ratio. Decoctions should be freshly made, as they are liable to decompose. The U. S. P. contains none.

Elixira (Elixirs).—Sweet and aromatic liquid preparations, containing 20 to 25 per cent. of alcohol. There are three in the U. S. P.:

Elixir Adjuvans, —Aromaticum, } used for flavoring.
—Ferri, Quininæ, et Strychninæ Phosphatum, Dose, 4 c.c. (1 fl. dr.).

Emplastra (Plasters).—Tenacious preparations for external application, solid at ordinary temperatures, but pliable and adhesive at the temperature of the body. Those of the U. S. P. are:

Emplastrum Plumbi, made with lead acetate, soap and water.
—Adhæsivum, —Hydrargyri, —Saponis } Lead plaster as the basis.
—Capsici, —Belladonnæ, —Opii } Adhesive plaster as the basis.

Emulsa (Emulsions).—Liquid preparations consisting of oily or resinous substances held suspended in water which has been rendered mucilaginous or viscid. Acacia and tragacanth are frequently used to form emulsions. Acacia is incompatible with ferric chloride, borax, and lead subacetate. Emulsions are coagulated by acids, an undue proportion of metallic salts, and spirituous liquids. There are in the U. S. P.:

	Dose.
Emulsum Olei Terebinthinæ	4 c.c. (1 fl. dr.).
—Chloroformi, —Olei Morrhuæ, ———cum Hypophosphitibus	8 c.c. (2 fl. dr.).
—Asafœtidæ	16 c.c. (4 fl. dr.).
—Amygdalæ	120 c.c. (4 fl. oz.).

Extracta (Extracts).—Solid or soft-solid preparations not agreeing in strength, made by evaporating solutions of the active constituents of organic drugs to the required consistency.

The drug is first powdered, then macerated and percolated with the appropriate menstruum to exhaustion. The first third of the percolate is reserved, the remainder is evaporated at a temperature not exceeding 50° C.; 122° F.; until its weight is ten per cent. of that of the drug used, then mixed with the reserved portion, and both are evaporated at or below the above-named temperature until an extract of a pilular consistence remains. For converting extracts into powdered extracts it is sometimes necessary to add an inert dry substance. The menstrua used are:

(*a*) Alcohol: Extractum Cannabis Indicæ, Colocynthidis Compositum, and Physostigmatis.

(*b*) Alcohol and water: Extractum Belladonnæ Foliorum, Ergotæ, Rhamni Purshianæ, and Taraxaci.

(*c*) Diluted alcohol: Extractum Colocynthidis.

(*d*) Water: Extractum Aloes, Gentianæ, Hæmatoxyli, Krameriæ, Opii, and Quassiæ.

(*e*) Water and Aqua Ammoniæ: Extractum Glycyrrhizæ Purum.

(*f*) Acetic Acid and water: Extractum Colchici Cormi.

(*g*) Acetic Acid, alcohol, and water: Extractum Nucis Vomicæ.

Obtained by maceration and evaporation: Extractum Malti.

Obtained by evaporating the fluidextract: Extractum Cimicifugæ, Digitalis, Euonymi, Hyoscyami, Leptandræ, Rhei, Scopolæ, Stramonii, and Sumbul.

There are in the U. S. P.:

	Dose.
Extractum Physostigmatis	0.008 gm.=8 milligm. ($\frac{1}{8}$ gr.).
—Belladonnæ Foliorum —Cannabis Indicæ —Digitalis —Scopolæ —Stramonii	0.010 gm.=10 milligm. ($\frac{1}{6}$ gr.).
—Nucis Vomicæ	0.015 gm.=15 milligm. ($\frac{1}{4}$ gr.).
—Colocynthidis —Opii.	0.030 gm.=30 milligm. ($\frac{1}{2}$ gr.).
—Colchici Cormi —Hyoscyami —Quassiæ	0.065 gm.=65 milligm. (1 gr.).
—Aloes —Euonymi	0.125 gm.=125 milligm. (2 gr.).
—Cimicifugæ —Ergotæ —Gentianæ —Leptandræ —Rhamni Purshianæ	0.250 gm.=250 milligm. (4 gr.).

	Dose.
Extractum Rhei —Sumbul	0.250 gm.=250 milligm. (4 gr.).
—Colocynthidis Compositum —Krameriæ	0.500 gm.=500 milligm. (7½ gr.).
—Glycyrrhizæ — —Purum —Hæmatoxyli —Taraxaci	1 gm. (15 gr.).
—Malti	16 c.c. (4 fl. dr.).

Fluidextracta (Fluidextracts).—Liquid preparations of organic drugs, made by completely exhausting the drug by suitable menstrua, and concentrating the resulting filtered solution, so that there shall be 1 c.c. of the latter for each gramme of drug extracted. They are made by percolation and partial evaporation, the menstruum employed being usually alcohol, diluted alcohol, or alcohol and water in various proportions. There are in the U. S. P.:

FLUIDEXTRACTS.

	Dose.
Fluidextractum Aconiti —Belladonnæ Radicis —Cannabis Indicæ —Capsici —Digitalis —Gelsemii —Nucis Vomicæ —Ipecacuanhæ (expectorant)	0.05 c.c. (1 ♏).
— — (emetic)	1 c.c. (15 ♏).
—Scopolæ —Staphisagriæ —Stramonii	0.05 c.c. (1 ♏).
—Sanguinariæ —Scillæ —Veratri —Phytolaccæ (alterative)	0.1 c.c. (1½ ♏)
— —(emetic)	1 c.c. (15 ♏).
—Colchici Seminis —Conii —Hyoscyami —Quillajæ	0.2 c.c. (3 ♏).
—Sabinæ	0.3 c.c. (5 ♏).

FLUIDEXTRACTS.

	Dose.
Fluidextractum Convallariæ	0.5 c.c. (8 ♏).
—Euonymi	
—Lobeliæ	
—Lupulini	
—Podophylli	
—Quassiæ	
—Apocyni	1 c.c. (15 ♏).
—Aromaticum	
—Aurantii Amari	
—Calami	
—Chiratæ	
—Cimicifugæ	
—Cinchonæ	
—Cubebæ	
—Cypripedii	
—Eriodictyi	
—Frangulæ	
—Gentianæ	
—Geranii	
—Krameriæ	
—Leptandræ	
—Quercus	
—Rhamni Purshianæ	
—Rhamni Purshianæ Aromaticum	
—Rhei	
—Rhois Glabræ	
—Rubi	
—Scutellariæ	
—Senegæ	
—Serpentariæ	
—Zingiberis	
—Berberidis	2 c.c. (30 ♏).
—Buchu	
—Calumbæ	
—Chimaphilæ	
—Cocæ	
—Ergotæ	
—Eucalypti	
—Eupatorii	
—Glycyrrhizæ	
—Granati	
—Grindeliæ	

FLUIDEXTRACTS.

	Dose.
Fluidextractum Guaranæ	2 c.c. (30 ♏).
—Hamamelidis Foliorum	
—Hydrastis	
—Lappæ	
—Pareiræ	
—Pilocarpi	
—Pruni Virginianæ	
—Rosæ	
—Sarsaparillæ	
— — Compositum	
—Sennæ	
—Stillingiæ	
—Sumbul	
—Uvæ Ursi	
—Valerianæ	
—Viburni Opuli	
— — Prunifolii	
—Xanthoxyli	
—Matico	4 c.c. (1 fl. dr.).
—Spigeliæ	
—Taraxaci	8 c.c. (2 fl. dr.).
—Tritici	
—Mezerei.	

Glycerita (Glycerites).—Solutions of drugs in glycerin. They are all liquid preparations, largely used for external application. In the U. S. P. are six:

Glyceritum Amyli.
—Boroglycerini.
—Phenolis, Dose, 0.3 c.c. (5 ♏).
Glyceritum Ferri, Quininæ et Strychninæ Phosphatum, Dose, 1 c.c. (15 ♏).
—Acidi Tannici, Dose, 2 c.c. (30 ♏
—Hydrastis, Dose, 2 c.c. (30 ♏).

Infusa (Infusions).—Liquid preparations of organic drugs, 50 grammes of drug to 1000 c.c. of infusion, unless otherwise specified by the physician or Pharmacopœia; made by exhausting the drug for a specified time in a covered vessel, by water poured upon it at a boiling temperature (excepting Infusion Pruni Virginianæ, which is made with cold water), straining, and adding sufficient water to secure the required ratio.

The infusions of the U. S. P. are:

	Dose.
Infusum Digitalis	8 c.c. (2 fl. dr.).
—Pruni Virginianæ	60 c.c. (2 fl. oz.).
—Sennæ Compositum	120 c.c. (4 fl. oz.).

Infusions should be freshly made, as they readily decompose.

Linimenta (Liniments).—Solutions or mixtures for external application, liquid, at least upon application. All of them are intended to be rubbed into the skin except Linimentum Calcis. Those in the U. S. P. are:

Linimentum Ammoniæ.	Ammonia water, cotton seed oil, alcohol and oleic acid.
—Belladonnæ	Fluidextract of belladonna root and camphor.
—Calcis	Lime water and linseed oil.
—Camphoræ	Camphor and cotton seed oil.
—Chloroformi	Chloroform and soap liniment.
—Saponis	Soap, camphor, oil of rosemary, alcohol, and water.
— — Mollis	Soft soap, oil of lavender flowers, and alcohol.
—Terebinthinæ	Rosin cerate and oil of turpentine.

Liquores (Liquors).—Solutions of chemical substances in a menstruum consisting chiefly or wholly of water. The following are in the U. S. P.:

	Dose.
Liquor Arseni et Hydrargyri Iodidi	0.1 c.c. (1½ ♏).
—Ferri Chloridi	
—Acidi Arsenosi	0.2 c.c. (3 ♏).
—Ferri Subsulphatis	
—Iodi Compositus	
—Potassii Arsenitis	
—Sodii Arsenatis	
—Potassi Hydroxidi	1 c c. (15 ♏).
—Sodæ Chlorinatæ	
—Sodii Hydroxidi	
—Antisepticus	4 c.c. (1 fl. dr.).
—Chlori Compositus	
—Sodii Phosphatis Compositus	8 c.c. (2 fl. dr.).
—Ammonii Acetatis	16 c.c. (4 fl. dr.)
—Calcis	
—Ferri et Ammonii Acetatis	
—Potassii Citratis	
—Magnesiæ Citratis	360 c.c. (12 fl. oz.)

The following are not used internally:

Liquor Cresolis Compositus.
—Ferri Tersulphatis.
—Formaldehydi.
—Hydrargyri Nitratis.
Liquor Plumbi Subacetatis.
— — Subacetatis Dilutus.
—Zinci Chloridi.

Massæ (Masses).—Pill-masses intended for preservation in bulk until required for use. Two are official in the U. S. P.:

	Dose.
Massa Ferri Carbonatis	0.250 gm.=250 milligm. (4 gr.).
—Hydrargyri	

They are often employed as constituents of other pill-masses. The Massa Ferri Carbonatis is not of sufficiently firm consistence to admit of being rolled into pills which will retain their spherical shape without the addition of absorbents, except when freshly made in warm weather.

Mellita (Honeys).—Mixtures of medicinal substances with clarified honey. The U. S. P. contains only two, one of these being simply honey purified.

Mel Depuratum. Mel Rosæ, Dose, 4 c.c. (1 fl. dr.).

Mixturæ (Mixtures).—Liquid preparations of insoluble, suspended, active substances, or solutions containing more than one liquid of therapeutic activity. The mixture is usually flavored, and is for internal administration. The U. S. P. contains four:

	Dose.
Mistura Rhei et Sodæ.....	4 c.c. (1 fl. dr.).
—Glycyrrhizæ Composita	8 c.c. (2 fl. dr.).
—Cretæ.....	16 c.c. (4 fl. dr.).
—Ferri Composita	

Mucilagines (Mucilages).—Adhesive liquids or jelly-like preparations, consisting of gum or starch dissolved in or fully charged with water. The U. S. P. contains four:

	Dose.
Mucilago Acaciæ.....	16 c.c. (4 fl. dr.).
—Sassafras Medullæ	
—Tragacanthæ.....	
—Ulmi	

Oleata.—Oleates are solutions in oleic acid, intended for external application. The U. S. P. contains five:

Oleatum Atropinæ (2 per cent. of atropine).
—Cocainæ (5 per cent. of cocaine).
—Hydrargyri (25 per cent. of yellow mercuric oxide).
—Quininæ (25 per cent. of quinine).
—Veratrinæ (2 per cent of veratrine).

Olea.—There are many oils in the Pharmacopœia. They are all obtained by distillation or by expression. The U. S. P. Olea are:

	Dose.
Oleum Sinapis Volatile	0.008 c.c. (⅛ ♏).
—Amygdalæ Amaræ	0.03 c.c. (½ ♏).
—Cinnamomi	0.05 c.c. (1 ♏).
—Sabinæ	
—Tiglii	
—Anisi	
—Aurantii Corticis	
—Cari	
—Caryophylli	
—Chenopodii	
—Coriandri	
—Fœniculi	
—Hedeomæ	
—Juniperi	
—Lavandulæ Florum	0.2 c.c. (3 ♏).
—Limonis	
—Menthæ Piperitæ	
— — Viridis	
—Myristicæ	
—Picis Liquidæ	
—Pimentæ	
—Rosmarini	
—Sassafras	
—Thymi	
—Cajuputi	0.5 c.c. (8 ♏).
—Copaibæ	
—Cubebæ	
—Eucalypti	
—Santali	

	Dose.
Oleum Betulæ	1 c.c. (15 m).
—Erigerontis	
—Gaultheriæ	
—Terebinthinæ Rectificatum	
—Gossypii Seminis	16 c.c. (4 fl. dr.).
—Morrhuæ	
—Ricini	
—Amygdalæ Expressum	30 c.c. (1 fl. oz.)
—Lini	
—Olivæ	
—Cadinum	externally.
—Terebinthinæ	
—Theobromatis	
—Adipis	in pharmacy.
—Æthereum	
—Rosæ	as flavoring agent.

Pilulæ (Pills).—Solid bodies, usually spherical or oval, containing medicinal agents, and intended to be swallowed whole. A mass of the consistence of firm clay is made by beating medicaments together in a mortar, and by means of a machine this is divided up and rolled into pills. In order to prevent their being tasted, they are usually varnished, gilded, or sugar-coated. Unless the constituents are very heavy, each pill should not exceed .30 gm. (5 grains) in weight, and the smaller they are the better. Soap, mucilage of acacia or tragacanth, and confection of rose are common excipients for pills. Glycerin is often added, as it attracts moisture and prevents the pill from getting hard, but pills made of it alone are too soft. Soap is useful for creosote and for essential oils if calcium phosphate and wheaten flour be added. Licorice powder is a good absorbent. All pills are useless unless so made that they will dissolve in the gastro-intestinal canal. If it is required that they should not be acted upon until they reach the intestine they should be coated with keratin. Pills, except when sugar- or gelatin-coated, are often kept in some powder, as lycopodium, to prevent their sticking together. The pills in the U. S. P. are:

	Dose.
Pilulæ Phosphori	1 pill.
—Opii	
—Podophylli, Belladonnæ et Capsici	

	Dose.
Pilulæ Aloes	2 pills.
— — et Ferri	
— — — Mastiches	
— — — Myrrhæ	
—Asafœtidæ	
—Catharticæ Compositæ	
— — Vegetabiles	
—Ferri Carbonatis	
— — Iodidi	
—Laxativæ Compositæ	
—Rhei Compositæ	

Pulveres (Powders).—Preparations consisting of finely-powdered drugs, or (compound powders) mixtures of the same, and frequently consisting in part of a suitable diluent or excipient. The best diluent for powders is sugar of milk, because of its hardness and comparative insolubility. The powders of the U. S. P. are:

	Dose.
Pulvis Acetanilidi Compositus	0.500 gm.=500 milligm. (7½ gr.).
—Ipecacuanhæ et Opii	
—Morphinæ Compositus	
—Aromaticus	1 gm. (15 gr.).
—Cretæ Compositus	2 gm. (30 gr.).
—Jalapæ Compositus	
—Rhei Compositus	
—Glycyrrhizæ Compositus	4 gm. (60 gr.).

Also Pulvis Effervescens Compositus (Seidlitz Powder), for which *see* Sodium. Pulvis Ipecacuanhæ et Opii is practically a trituration.

Spiritus (Spirits).—Solutions of volatile substances in alcohol or diluted alcohol. The spirits of the U. S. P. are:

By solution:

	Dose.
Spiritus Glycerylis Nitratis	0.05 c.c. (1 ♏).
—Amygdalæ Amaræ	0.5 c.c. (8 ♏).
—Camphoræ	1 c.c. (15 ♏).
—Ammoniæ Aromaticus	2 c.c. (30 ♏).
—Chloroformi	
—Cinnamomi	
—Gaultheriæ	
—Juniperi	
—Lavandulæ	

	Dose.
Spiritus Ætheris	4 c.c. (1 fl. dr.).
— — Compositus	
—Anisi	
—Juniperi Compositus	8 c.c. (2 fl. dr.).
—Aurantii Compositus	as vehicle.
By solution with maceration:	
Spiritus Menthæ Piperitæ	2 c.c. (30 ♏).
— — Viridis	
By gaseous solution:	
Spiritus Ammoniæ	1 c.c. (15 ♏).
By chemical reaction:	
Spiritus Ætheris Nitrosi	2 c.c. (30 ♏).
By distillation:	
Spiritus Frumenti	
—Vini Gallici	

Suppositoria (Suppositories).—Preparations in suitable form for introduction into and retention in the rectum or vagina and so mixed with a base (generally Oleum Theobromatis) that they shall be solid under ordinary conditions, but melt or liquefy after introduction. One only is official in U. S. P.:

Suppositoria Glycerini: base, stearic acid.

Syrupi (Syrups).—Liquid preparations of drugs consisting chiefly of a concentrated aqueous solution of sugar. There are in the U. S. P.:

	Dose.
Syrupus Ferri Iodidi	1 c.c. (15 ♏).
—Ipecacuanhæ (expectorant)	
— — (emetic)	15 c.c. (4 fl. dr.).
—Calcis	2 c.c. (30 ♏).
—Scillæ	
— — Compositus	
—Acidi Hydriodici	4 c.c. (1 fl. dr.).
—Amygdalæ	
—Ferri, Quininæ et Strychninæ Phosphatum	
—Krameriæ	
—Picis Liquidæ	
—Pruni Virginianæ	
—Rubi	
—Senegæ	
—Sennæ	

	Dose.
Syrupus Calcii Lactophosphatis	8 c.c. (2 fl. dr.).
—Hypophosphitum.	
— — Compositus	
—Lactucarii	
—Rhei	
— — Aromaticus	
—Sarsaparillæ Compositus	16 c.c. (4 fl. dr.).
—Tolutanus	
—Zingiberis	
Syrupus, as a vehicle.	
—Aciæ	Flavoring.
—Acidi Citrice	
—Aurantii	
— — Aurantii Florum	
—Rosæ	

Tincturæ (Tinctures).—Solutions in alcohol or diluted alcohol of the soluble constituents of substances which are not volatile. (The U. S. P. includes also, as an exception, the alcoholic solution of iodine.) They are prepared by—

(*a*) Maceration; *e. g.*, Tinctura Opii Camphorata.
(*b*) Percolation; *e. g.*, Tinctura Lavandulæ Composita.
(*c*) Maceration and percolation; *e. g.*, Tinctura Opii.
(*d*) Simple mixing of ingredients; *e. g.*, Tinctura Ipecacuanhæ et Opii.

Tinctures containing only one active substance are simple. The rest are compound; *e. g.*, Tinctura Gentianæ Composita.

Some are compound, although this is not expressed in their name; *e. g.*, Tinctura Aloes.

The tinctures of the U. S. P. are:

	Dose.
Tinctura Iodi	0.1 c.c. (1½ ♏).
—Cantharidis	0.3 c.c. (5 ♏).
—Belladonnæ Foliorum	0.5 c.c. (8 ♏).
—Capsici	
—Ferri Chloridi	
—Gelsemii	
—Ipecacuanhæ et Opii	
—Opii	
— — Deodorati	
—Stramonii	
—Strophanthi	

	Dose.
Tinctura Aconiti	0.6 c.c. (10 ♏).
—Cannabis Indicæ	
—Nucis Vomicæ	
—Arnicæ	1 c.c. (15 ♏).
—Asafœtidæ	
—Benzoini	
—Digitalis	
—Hyoscyami	
—Lobeliæ (expectorant)	
— — (emetic)	4 c.c. (1 fl. dr.).
—Myrrhæ	1 c.c. (15 ♏).
—Physostigmatis	
—Sanguinariæ	
—Scillæ	
—Veratri	
—Aloes	2 c.c. (30 ♏).
— — et Myrrhæ	
—Benzoini Composita	
—Cinnamomi	
—Colchici Seminis	
—Guaiaci Ammoniata	
—Lactucarii	
—Lavandulæ Composita	
—Quassiæ	
—Rhei Aromatica	
—Tolutana	
—Valerianæ Ammoniata	
—Zingiberis	
—Aurantii Amari	4 c.c. (1 fl. dr.).
— — Dulcis	
—Calumbæ	
—Cardamomi	
— — Composita	
—Cimicifugæ	
—Cinchonæ	
— — Composita	
—Gallæ	
—Gambir Composita	
—Gentianæ Composita	
—Guaiaci	
—Hydrastis	
—Kino	
—Krameriæ	

	Dose.
Tinctura Moschi	4 c.c. (1 fl. dr.).
—Rhei	
—Serpentariæ	
—Valerianæ	
—Opii Camphorata	8 c.c (2 fl. dr.).
—Calendulæ	Externally.
—Pyrethri	
—Quillajæ	In pharmacy.
—Limonis Corticis	Flavoring.
—Vanillæ	

The U. S. P. also contains Tincturæ Herbarum Recentium (Tinctures of Fresh Herbs). These, unless otherwise directed, are of fifty per cent. strength, the fresh herb being cut, bruised or crushed, and then macerated.

Triturationes (Triturations).—Solid preparations made by triturating a medicinal substance with a definite percentage of sugar of milk (Saccharum Lactis). The U. S. P. contains one:

Trituratio Elaterini., Dose, 0.030 gm.=30 milligm. (½ gr.).

Trochisci (Troches).—Solid preparations, usually in flattened form, consisting of one or more medicinal substances mixed with sugar or extract of liquorice and held in form by the addition of mucilage. These are official in the U. S. P.:

Trochisci Acidi Tannici.
—Ammonii Chloridi.
—Cubebæ.
—Gambir.
—Glycyrrhizæ et Opii.
Trochisci Krameriæ.
—Potassii Chloratis.
—Santonini.
—Sodii Bicarbonatis.

Unguenta (Ointments).—Unctuous preparations, either soft or solid at ordinary temperatures, but liquid upon being rubbed upon the skin. They are generally spread over the skin, or may be rubbed into it, and they are intended for external use only. The basis is either lard, olive oil, expressed oil of almond, lard oil, wax, suet, spermaceti, hydrous wool-fat, petrolatum or paraffin. When it is required that the active ingredient shall be absorbed, lard, which melts at about the temperature of the body, or hydrous wool-fat, is the best basis; when the ointment is re-

quired for open wounds, paraffin is a good basis, as it softens only a little at the temperature of the body. In hot countries, if the ointment would otherwise be too soft, the basis may be replaced by indurated lard, prepared suet, or white or yellow wax. Benzoinated lard is often used to prevent decomposition. The following are official in the U. S. P.:

Unguentum.
—Acidi Borici.
——Tannici.
—Aquæ Rosæ.
—Belladonnæ.
—Chrysarobini.
—Diachylon.
—Gallæ.
—Hydrargyri.
——Ammoniati.
——Dilutum.
——Nitratis.
——Oxidi Flavi.
Unguentum Hydrargyri Oxidi Rubri.
—Iodi.
—Iodoformi.
—Phenolis.
—Picis Liquidæ.
—Potassii Iodidi.
—Stramonii.
—Sulphuris.
—Veratrinæ.
—Zinci Oxidi.
——Stearatis.

Vina.—Wines are weak tinctures, the drug being extracted with white wine, containing not less than 7 per cent. nor more than 12 per cent. by weight of absolute alcohol. The wines of the U. S. P. are:

	Dose.
Vinum Opii	0.5 c.c. (8 ♏).
—Antimonii	1 c.c. (15 ♏).
—Ipecacuanhæ	
—Colchici Seminis	2 c.c. (30 ♏).
—Ergotæ	8 c.c. (2 fl. dr.).
—Ferri	
——Amarum	
—Cocæ	16 c.c. (4 fl. dr.).
—Album	as menstruum.
—Rubrum	

With Vinum Antimonii and Vinum Ipecacuanhæ the dose depends upon the purpose for which the drug is used.

The following preparations not occurring in the U. S. P. are used:

Abstracta (Abstracts).—Solid, dry, powdered extracts of double the strengh of the crude drug. They are prepared by spontaneous evaporation of an alcoholic tincture at a low temperature, mixing with it enough sugar of milk to make the product weigh one-half of the original weight of the drug, and then reducing it to a fine powder.

Boluses.—A British name for Confections.

Bougies.—Solid cylinders impregnated with various drugs, and used for introduction into the urethra, uterus, or nose. They are made either of gelatin (to be dipped in warm water before use) or cacao butter (to be dipped in oil before use).

Cachets, made of wafer paper, consist of two watch-glass shaped halves, enclosing the drug, which adhere when moistened. The cachet is swallowed, and thus nauseous drugs are not tasted.

Capsules, usually made of gelatin, are also used for enclosing medicines so that they shall not be tasted, and they are now made for containing both solid and liquid substances. They are either soft and elastic or hard. The "empty capsule" is of the hard form and is made in two parts, the body to be filled when required for use, and the cap to fit tightly over it when filled. Pills, cachets and capsules should be immediately followed by enough water to wash them down.

Cigarettes.—The drug replaces the tobacco of an ordinary cigarette.

Clysters.—Another name for Enemata.

Collunaria.—Fluids used as nasal douches. This term is rarely used in the United States.

Collyria.—Fluids used as eye washes

Conserves.—A British name for Confections.

Cremora.—(Obsolete in the United States.) Creams are preparations having glycerin, vaseline, or some such substance as a basis, and used for external application.

Electuaries.—Another name for Confections.

Enemata (Enemas).—Liquids intended for injection into the rectum and designed to act medicinally, to evacuate the bowel mechanically, or to serve as nutrients. When their object is to empty the bowel, they are usually large in bulk, 300 to 600 c.c. (10 to 20 fl. oz.); when it is wished that they should be retained, they are small, 60 to 150 c.c. (2 to 5 fl. oz.), and after injection a towel may be pressed against the anus. Mucilage, made with starch, is a good basis.

Essentiæ (Essences).—Preparations corresponding to Spirits, U. S. P., but of 20 per cent. strength.

Fomenta.—Fomentations consist of flannels wrung out in hot water, to which drugs may or may not have been added.

Gargarismata (Gargles) are fluid preparations for gargling.

Granules are small pills.

Guttæ (Drops).—In England this term is used to designate liquid preparations to be dropped into the eye.

Haustus (Draught.)—This term is used when only a single dose of a fluid preparation is required.

Injectiones (Injections).—These are of two kinds, Rectal (*see* Enemata), and Hypodermatic. The latter are highly concentrated solutions intended for use by means of a hypodermatic needle.

Inhalations.—A common name for Vapors (*see* below).

Insufflationes.—Powdered medicines or medicated powders designed for blowing into the nares, larynx or throat.

Lamellæ.—Small thin discs made with gelatin and glycerin, and used to drop into the eye. They each weigh .0013 gm. ($\frac{1}{50}$ of a grain).

Lanolinum is an ointment having hydrous wool-fat as a basis.

Linctus.—(Never used in the United States.) A sweet mixture of a thick, syrupy consistence. It is to be swallowed slowly, being retained some time in the mouth.

Lotiones (Lotions).—Liquid, usually aqueous, preparations for external use, commonly applied upon lint or muslin.

Mollinum.—An ointment having for its basis mollin, a superfatted soap. It is readily absorbed, and also readily washed off with water.

Nebulæ (Sprays).—Solutions sprayed into the throat or nose by means of an atomizer.

Oxymellita.—Mellita containing acetic acid.

Paste.—A preparation to be applied as an ointment.

Pastilli (Pastils).—A name often applied to troches, and in England limited to those having glyco-gelatin as a basis.

Perles are small pills.

Pessus.—Pessaries are solid preparations made like suppositories for introduction into the vagina. This term is rarely used in the United States.

Pigmenta (Paints).—Liquid preparations adapted for painting on the skin, throat, etc.

Succi (Juices).—Expressed vegetable juices preserved by the addition of a definite proportion of alcohol.

Tabellæ.—(Tablets or Tabloids, the latter of British usage.) Solid, disc-like or lenticular bodies made by compression. "Tablet triturates" are composed of drugs which have been triturated before compression. They are very popular, but are often useless, for they may be so hard and insoluble that they are found in the fæces quite unaltered. Tablets should therefore always be prescribed extemporaneously and freshly made.

Vapores.—Liquid preparations intended for administration by inhalation in form of vapor.

Vaselinum.—This term in England is applied to an ointment of which the base is vaseline.

PRESCRIBING.

The more complex **prescriptions** consist of—

(1) The Basis, or principal active ingredient (*curare*).
(2) The Adjuvans, or that which assists its action (*cito*).
(3) The Corrigens, or that which corrects its operation (*tuto*).
(4) The Constituens, vehicle, or excipient, which imparts an agreeable form (*jucunde*).

Thus, the object of every prescription is to cure quickly, safely and pleasantly. For example, in Pilula Rhei Composita the rhubarb is the basis, the aloes and myrrh form the adjuvans, and the oil of peppermint is the corrigens to prevent the griping. In Mistura Cretæ the cinnamon water is the vehicle. Many drugs do not require anything to assist their action or correct their operation. The scientific physician usually prefers to administer the remedies separately, in order to more accurately observe their effect, and as well to discontinue, or change the dose of, any one which may be necessary.

Incompatibility of ingredients should be particularly avoided in prescriptions. There are three kinds of incompatibility:

(*a*) *Chemical Incompatibility; e.g.*, **Glucosides** should not be ordered with free acids, which decompose them; nor **Alkaloids** or **Alkaloidal Salts** with alkalies, alkaline salts, tannic acid, iodides, or bromides, for they precipitate them.

Examples of chemical incompatibility are the prescribing of (1) tannic acid or substances containing it with alkaloids or metallic salts, especially those of iron; (2) vinegars or syrups containing acetic acid prescribed with carbonates lead to the evolution of carbon dioxide; (3) strychnine sulphate is decomposed by potassium bromide, and strychnine is precipitated; (4) hydrated chloral and alkalies form chloroform; (5) quinine sulphate and potassium acetate together cause a voluminous precipitate of quinine acetate; (6) lime water with mercury salts (this incompatibility is intentional in Lotio Nigra and Lotio Flava) precipitates mercuric oxides; it decomposes carbonates and bicarbonates of alkalies; it precipitates solutions of quinine and morphine salts; (7) corrosive mercuric chloride is incompatible with most substances.

The following table, drawn up by Potter (Materia Medica, Pharmacy and Therapeutics, 10th Ed., p. 519) shows the most important instances of solutions which mutually precipitate each other. The letter "P" means "forms a precipitate with."

Solutions of	Alkaloidal Solutions (generally).	Metallic Solutions (generally).	Solutions of Lead or Silver Salts.	Solutions of Calcium Salts.	Solutions of Magnesium Salts.	Solutions of Albumin or Gelatin.
Alkalies	P	P	P	P	P	—
Tannic acid	P	P	P	—	—	P
Carbonic acid and Carbonates	P	P	P	P	P	—
Sulphuric acid and Sulphates	—	—	P	P	—	—
Phosphoric acid and Phosphates	P	P	P	P	P	—
Boric acid and Borates	P	P	P	—	—	—
Hydrochloric acid and Chlorides	—	—	P	—	—	—
Hydrobromic acid and Bromides	—	—	P	—	—	—
Hydriodic acid and Iodides	P	—	P	—	—	—
Sulphides	—	P	P	—	—	—
Arsenical Preparations	—	P	P	—	—	—
Albumin	—	P	P	—	—	—

With the following drugs it is **particularly difficult to avoid chemical incompatibility.**

Antipyrine.	Potassium Permanganate.
Chlorine in solution.	Potassium Acetate.
Liquid preparations of Iron.	Nitrites.
Lead salts.	Tannic Acid.
Zinc salts.	Gallic Acid.
Silver salts.	Diluted Hydrocyanic Acid.
Corrosive Mercuric Chloride (especially).	Mineral Acids.
Iodine and the Iodides.	Solution of Potassium Hydroxide.
All Bromides.	Quinine Sulphate.
	Tincture of Guaiac.

Substances rich in oxygen, as chlorates, iodates, permanganates, picrates, nitrates and bichromates should **not** be mixed **with readily oxidizable substances,** such as charcoal, sulphur, iodine, phenol, glycerin, turpentine, and organic compounds generally, for explosive compounds are very liable to be formed.

Poisonous compounds may be formed by the admixture of substances in solution: *e. g.*, potassium chlorate and the syrup of ferrous iodide liberate

iodine; diluted hydrocyanic acid and calomel form mercuric cyanide; potassium chlorate and potassium iodide form, at the temperature of the body, a poisonous compound, probably potassium iodate. Fatal results have been known to occur from the use of prescriptions thus carelessly made.

If, in a mixture, incompatibles are inevitable, they should both be diluted with the vehicle before they are added to each other. The careful prescriber will avoid combining any of the above incompatible substances.

(*b*) *Physical Incompatibility.*—This occurs when the mixture of the substances will not form a clear solution; *e. g.*, insoluble powders and oils will not mix with water, the addition of which, to some spirits and all resinous tinctures, and to fluidextract of male fern causes a precipitate; if an acid mixture is flavored with licorice, the acid precipitates glycyrrhizin; an alcoholic solution added to chloral hydrate causes all the chloral to rise to the top.

In such cases the aqueous solution may be **thickened** so that the precipitate is suspended in it **to form an emulsion,** but even then the mixture must be shaken before a dose is taken. **Mucilage of acacia,** freshly made, is the best emulsifying agent. The substances incompatible with it are mentioned under Acacia. It should be made perfectly fresh. The addition of a little almond oil improves its appearance.

1 pt. of most fixed oils requires of acacia ¾ pt., water 1 pt.

1 pt. of balsam of Peru requires of acacia 2 pt., water 1½ pt.

1 pt. of oil of turpentine requires of acacia 1 pt., water 1 pt.

Tragacanth, because its preparations keep better, is often used to form an emulsion or a suspension, and sometimes yolk of egg or milk is employed. **Solution of Potassium Hydroxide** greatly facilitates the admixture of fixed oils and water, although it often acts chemically on the ingredients of the prescription. Tincture of senega aids the emulsification of any oil, even in small quantities, .60 c.c. (ɱ x); being sufficient for 30 c.c. (1 fl. oz.), of a fixed oil. Magnesium carbonate is employed to aid the diffusion of an oil in water through which air is to be inhaled. Resinous tinctures require an emulsifying agent; an equal part of mucilage of acacia is the best.

(*c*) *Pharmacological Incompatibility; e.g.*, the combination of purgatives with astringents. Sometimes this is intentional, as in the addition of atropine to a hypodermatic solution of morphine. After the description of each drug those substances which are incompatible with it will be enumerated.

THE PRESCRIPTION.

The details of a prescription should be written in the following order:

The *first* part is the *Superscription*, which is the sign ℞, an abbreviation for Recipe, "Take."

The *second* part is the *Inscription*, consisting of the names of the drugs in the genitive case (the vehicle in the accusative if *ad* is used with it), and their doses in the accusative.

The *third* part is the *Subscription*, that is to say, the directions to the dispenser. This in the United States and most other countries is written in Latin, but in France it is in the language of the country.

The *fourth* part is the *Signature*, that is to say, the directions to the patient (from the Latin "*Signetur*," let it be labelled). This is written in English.

The *fifth* part consists of the physician's name or initials at the bottom on the right, the patient's name at the bottom on the left, and under it the date; thus:

Superscription.—℞.

Inscription.—Tincturæ Ferri Chloridi, 12 c.c.; fl ℥ iij (*basis*).
Quininæ Hydrochloridi, 2 gm.; gr. xxx (*adjuvans*).
Magnesii Sulphatis, 60 gm.; ℥ ij (*corrigens*).
Glycerini, 60 c.c.; fl ℥ ij (*corrigens*).
Infusum Cinchonæ, ad 240 c.c.; fl ℥ viij (*excipient*).

Subscription.—Fiat mistura.

Signature.—Take one table-spoonful three times daily, two hours after meals. A. B. C. (physician's initials).
William Smith, Esq. (patient's name).
17th June, 1907 (date).

On the continent and in countries where the metric system is generally employed the quantities, either of fluids or solids, are expressed in grammes, so that the abbreviation is omitted; 60 meaning 60 gm. or 60 c.c. as the substance may be solid or liquid.

Abbreviations.—Although abbreviations are objectionable, yet this prescription could be written thus:

℞. Tinct. Fer. Chlor., 12 c.c.; fl ℥ iij.
Quin. Hydrochlor., 2. gm.; gr. xxx.
Mag. Sulphat., 60 gm.; ℥ ij.
Glycer., 60 c.c.; fl ℥ ij.
Inf. Cinch., ad 240 c.c.; fl ℥ viij.
F. m.

S. Take one table-spoonful thrice daily, two hours after meals.
William Smith, Esq. A. B. C.
17th June, 1907.

S, ss. and *ʃs.* are abbreviations for *semi*, a half, and *āā* for *ana*, of each.

Ad.—The prescriber should be careful in deciding whether or not to use this word before the vehicle. If it had been left out in the prescription

given here and on p. 42, the bulk of the mixture would have been nearly 315 c.c. (10½ fluid ounces) and the amount of the ingredients in each dose would have been less than was intended.

The following is a prescription for a pill:

℞. Extracti Nucis Vomicæ, .015 gm.; gr. ¼.
Extracti Euonymi,
Aloini, āā .03 gm.; gr. ss.
Hydrargyri Chloridi Mitis, .06 gm.; gr. j.
Extractum Hyoscyami, ad .30 gm.; gr. v.
Fiat Pilula. Mitte 24.

S. Take one immediately before dinner every evening.
William Smith, Esq. A. B. C.
17th June, 1907.

It will be observed that the quantities in the prescription are for one pill only, and the apothecary is directed to send 24. Often, however, the prescription is written with the quantity of each ingredient necessary to make the full number of pills. Thus:

℞. Extracti Nucis Vomicæ, .36 gm.; gr. vj.
Extracti Euonymi,
Aloini, āā .75 gm.; gr. xij.
Hydrargyri Chloridi Mitis, 1.50 gm.; gr. xxiv.
Extractum Hyoscyami, ad 8 gm.; gr. cxx.
Fiant Pilulæ. Mitte 24.

S. Take one immediately before dinner every evening.
William Smith, Esq. A. B. C.
17th June, 1907.

Prescriptions for powders are also written in either way.

The medicine may be prescribed as a pill when it is required that the patient shall carry it about with him, when only a small dose is needed, when it is desirable that it shall act slowly, when it is required to act on the lower bowel, when it is insoluble or nauseous, or when it is difficult to prescribe in the liquid form. Kaolin is the best basis for substances, as potassium permanganate, which are decomposed by contact with organic matter.

Oils, and volatile, deliquescent or bulky substances should not be prescribed as pills, as they require much solid excipient; nor should pills be used for substances required to act immediately. Insoluble or very disagreeable powders are often given in *cachets*.

Abbreviations should be employed as little as possible. Serious mistakes have happened because the abbreviations have been ambiguous. The following are especially to be avoided:

Acid. Hydroc. (may be Acidum Hydrochloricum or Acidum Hydrocyanicum).

Ex. Col. (may be Extractum Colchici Cormi or Extractum Colocynthidis).

Hyd. Chlor. (may be Calomel, Corrosive sublimate or Hydrated Chloral).

Hyd. (may be Hydrargyrum, Hydras, Hydriodas, Hydrochloridum, Hydrochloras or Hydrocyanicus).

Sulph. (may be Sulphide, Sulphate, or Sulphite).

Sometimes the signature is written in Latin, and it is often abbreviated.

The following Latin phrases with their abbreviations are commonly used in the writing of prescriptions:

āā.	Ana	of each.
Ad.	Adde	add.
Adhid.	Adhibendus	to be administered.
Admov.	Admove	apply.
Ad lib.	Ad libitum	to the desired amount.
Ad sat.	Ad saturandum	to saturation.
Ad us.	Ad usum	according to custom.
Æq.	Æquales	equal.
Agit.	Agitetur	let it be shaken.
Alt. hor.	Alternis horis	every other hour.
Ampul.	Ampulla	a large bottle.
Aq.	Aqua	water.
Aq. bull.	Aqua bulliens	boiling water.
Aq. dest.	Aqua destillata	distilled water.
Aq. ferv.	Aqua fervens	hot water.
Aq. fluv.	Aqua fluviatilis	river water.
Aq. font.	Aqua fontis	spring water.
Aq. pluv.	Aqua pluvialis	rain water.
Bene	Bene	well.
Bib.	Bibe	drink.
Bis ind.	Bis indies	twice a day.
Bis in 7 d.	Bis in septem diebus	twice a week.
Bol.	Bolus	a large pill.
Bull.	Bulliat	let it boil.
C.	Cum	with.
Calef.	Calefactus	warmed.
Cap.	Capiat	let him take.
Cap.	Capsula	a capsule.
Chart.	Charta	a paper.
Chartul.	Chartula	a small paper.

Cib.	Cibus	food.
Cito disp.	Cito dispensetur	let it be dispensed quickly.
C. m.	Cras mane	to-morrow morning.
C. m. s.	Cras mane sumendus	to be taken to-morrow morning.
C. n.	Cras nocte	to-morrow night.
Cochl.	Cochleare	a spoonful.
Cochl. ampl.	Cochleare amplum	a table-spoonful.
Cochl. infant.	Cochleare infantis	a teaspoonful.
Cochl. mag.	Cochleare magnum	a table-spoonful.
Cochl. mod.	Cochleare modicum	a dessert-spoonful.
Cochl. parv.	Cochleare parvum	a teaspoonful.
Col.	Cola	strain.
Collun.	Collunarium	a nasal wash.
Collut.	Collutorium	a mouth wash.
Collyr.	Collyrium	an eye wash.
Cont.	Contere	rub together.
Contin.	Continueter	let it be continued.
Cras.	Cras	to-morrow.
Cuj.	Cujus	of which.
C. v.	Cras vespere	to-morrow evening.
Cyath.	Cyathus	a glassful.
Cyath. vinos.	Cyathus vinosus	a wine glassful.
D.—d.	Da	give.
D.	Dosis	a dose.
Deaur.	Deaurentur	let them (the pills) be gilded.
Dec.	Decanta	decant.
D. d. in d.	De die in diem	from day to day.
Det.	Detur	let it be given.
Dieb. alt.	Diebus alternis	on alternate days.
Dim.	Dimidius	one-half.
Div.	Divide	divided.
D. in pæ.	Divide in partes æquales	divided into equal parts.
Exhib.	Exhibiatur	let it be given.
F. or ft.	Fiat	let it be made.
F. h.	Fiat haustus	make a draught.
F. m.	Fiat mistura	make a mixture.
F. pil.	Fiat pilula	make a pill.
Form.	Formula	a prescription.
F. s. a.	Fac secundum artem	make according to art.
Garg.	Gargarisma	a gargle.
Gtt.	Gutta or guttæ	drop or drops.
Habt.	Habeat	let him have.
Hor. decub.	Horâ decubitus	at bedtime.

Hor. intermed.	Horis intermediis	at intermediate hours.
H. s.	Horâ somni	at bedtime.
Ill.	Illico	immediately.
Imp.	Impone	apply.
Ind.	Indies	daily.
Instar	Instar	the size of.
Involv. gelat.	Involve gelatino	coat with gelatin.
Lat. dol.	Lateri dolenti	to the painful side.
Len.	Lenitur	easily.
Len. ter.	Lenitur terendo	by rubbing gently.
Mane.	Mane	in the morning.
Mane primo.	Mane primo	early in the morning.
Mic. pan.	Mica panis	bread crumb.
Mit.	Mitte	send.
Mod. dict.	Modo dictu	in the manner directed.
Mod. præscript.	Modo præscripto	in the manner prescribed.
Non repetat.	Non repetatur	let it not be repeated.
O. m.	Omni mane	every morning.
Omn. bih.	Omni bihorâ	every two hours.
Omn. hor.	Omni horâ	every hour.
O. n.	Omni nocte	every night.
P. or pt.	Perstetur	continue.
Part. æq.	Partes æquales	equal parts.
Penicil. cam.	Penicillum camelinum	a camel's hair pencil.
Pil.	Pilula	a pill.
P. r. n.	Pro re natâ	when required.
Q. hor.	Quâquâ horâ	every hour.
Q. l.	Quantum libet	as much as is requisite.
Q. s.	Quantum sufficit	a sufficient quantity.
Q. v.	Quantum volueris	at will.
R.	Recipe	take.
Red. in pulv.	Redactus in pulverem	reduced to powder.
Rep.	Repetatur	let it be repeated.
Sat.	Satis	sufficient.
Semel	Semel	once.
Semi h.	Semi hora	half an hour.
Sesq. h.	Sesqui hora	an hour and a half.
Sic.	Sicetur	let it be dried.
Sin.	Sine	without.
Sing.	Singulorum	of each.
Si op. sit.	Si opus sit	if necessary.
Sum.	Sumat or sumendum	let him take or let it be taken.
T. d.	Ter in die	three times a day.

Ter.	Tere	Rub.
Ter. bene	Tere bene	Rub well.
Trit.	Trituretur	let it be triturated.
Utere	Utere	make use of.
Vehic.	Vehiculum	menstruum.
Ver.	Verus	genuine.
Vesp.	Vesper	the evening.

In the United States it is always understood, unless otherwise stated, that the preparations are those directed by the Pharmacopœia.

Dispensing the Prescription.—The dispenser should bear the following rules in mind: (1) Read the prescription through first. (2) Next write the directions, so that they have time to dry. (3) Solution by heat should not be used if more of the salt is ordered than will dissolve in cold water. In such case it must be suspended. (4) With fluids, measure them in such an order that the measuring glass shall be finally rinsed out with vehicle. (5) Use glass scale pans. (6) Clean and put away everything directly after use. (7) If in the slightest doubt, ask the prescriber. (8) If finally the prescription contains any insoluble matter, label "Shake the bottle." (9) If the medicine is very poisonous, label it as such and use a distinctive bottle. (10) If for outward application only, label it as such. (11) In dispensing substances chemically incompatible, if there is any likelihood that the new body formed is dangerous, communicate with the prescriber before dispensing (*e. g.*, Potassii Iodidum prescribed with Spiritus Ætheris Nitrosi forms free iodine; alkaloids are precipitated by alkalies). Should there be no such reason against dispensing the prescription, keep the incompatibles as far apart as possible by diluting each with the vehicle before mixing.

PART I. INORGANIC MATERIA MEDICA.

DIVISION I: THE NON-METALS.

GROUP I.

THE HALOGENS.

Chlorine, Bromine, Iodine.

I. CHLORUM.

CHLORUM.—Chlorine. Cl=35.18.

This gas is not official under its own name, but is obtained from two sources of it, viz., Hydrochloric Acid and Chlorinated Lime.

Preparations.

1. **CALX CHLORINATA**—Chlorinated Lime. Chlorinated Calcium Oxide. *Synonym.*—Bleaching powder. A compound resulting from the action of Chlorine upon Calcium Hydroxide, and containing not less than 30 per cent. of available Chlorine. It is often improperly called "Chloride of Lime." It should be kept in well-closed vessels, in a cool and dry place. It may be regarded either as a compound of Calcium Hypochlorite and Chloride, or as one of Lime and Chlorine.

SOURCE.—Pass Chlorine gas over slaked Lime. $2Ca(OH)_2+2Cl_2=CaCl_2O_2+CaCl_2+2H_2O$.

CHARACTERS.—A white, or grayish-white, granular powder, exhaling the odor of Hypochlorous Acid, having a repulsive, saline taste, and becoming moist and gradually decomposing on exposure to air.

Dose, 0,250 gm.=250 milligm. (4 gr.).

2. **LIQUOR CHLORI COMPOSITUS.**—Compound Solution of Chlorine. *Synonym.*—Chlorine Water. An aqueous solution, containing, when freshly prepared, about 0.4 per cent. of Chlorine, with some oxides of Chlorine and Potassium Chloride.

SOURCE.—Pass cold distilled water, in successive portions, into a flask containing freshly generated Chlorine gas. The gas is obtained by heating Hydrochloric Acid, 18; and Potassium Chlorate, 5. $6HCl+KClO_3=3Cl_2+3H_2O+KCl$.

CHARACTERS.—A clear, greenish-yellow liquid, having the suffocating odor and disagreeable taste of Chlorine. The solution should be freshly made when wanted.

INCOMPATIBLES.—Alkalies, ammonium, arsenous, ferrous, mercurous, lead and silver salts, bromides, hypophosphites, iodides, lime water, oxalic acid.

Dose, 4 c.c. (1 fl. dr.).

Free Chlorine is contained in Acidum Nitrohydrochloricum Dilutum.

3. **LIQUOR SODAE CHLORINATAE.**—Solution of Chlorinated Soda. *Synonym.*—Labarraque's Solution. An aqueous solution of several Chlorine compounds of Sodium, containing at least 2.4 per cent., by weight, of available Chlorine.

SOURCE.—A solution of Monohydrated Sodium Carbonate, 65; Chlorinated Lime, 90; in water to 1000.

CHARACTERS—A clear, pale-greenish liquid, having a faint odor of Chlorine and a disagreeable, alkaline taste. Sp. gr., about 1.050.

Dose, 1 c.c. (15 ♏).

ACTION.

Antiseptic; disinfectant; stimulating; intensely irritating to mucous membranes, especially those of the deeper respiratory passages. Action mainly local, but aside from this it is thought to have a narcotic effect upon the brain.

USES.

Chlorine is inferior to formaldehyde and sulphurous acid anhydride as a disinfectant for rooms, because it is more difficult to apply in sufficient quantity, and it also has the disadvantage of injuring or bleaching fabrics. Fresh chlorinated lime is the best disinfectant for excreta, and is also excellent for drains, closets, urinals, etc. The chlorinated preparations are very useful for destroying fetor in scarlet fever, diphtheria, aphthæ and gangrene, and also in sloughing wounds and ulcers. Chlorine water is somewhat stimulating, and, well diluted, it has been used with good effect in the diarrhœa of typhoid fever, especially in markedly septic patients.

Toxicology.—In poisoning by inhalation, inhalation of steam and of ammoniacal gas; in poisoning by the mouth, emetics or washing out the stomach, alkalies to neutralize the acid formed, white of egg or other form of albumin, milk, flour. Anodynes or stimulants may be called for,

II. BROMUM.

BROMUM.—Bromine. Br=79.36. It should contain not less than 97 per cent. of pure Bromine, and be kept in protected glass-stoppered bottles, in a cool place.

SOURCE.—Obtained from sea water and saline springs.

CHARACTERS.—A heavy, dark, brownish-red, mobile liquid, evolving, even at ordinary temperatures, reddish fumes, highly irritating to the eyes and lungs, and having a peculiar suffocating odor, resembling that of Chlorine. Sp. gr., about 3.061 at 15° C. (59° F.). *Solubility.*—In 28 parts of water; readily in Alcohol and Ether; also in Chloroform and Carbon Disulphide.

IMPURITIES.—Iodine, organic bromine compounds.

Preparations.

1. **AMMONII BROMIDUM.**—Ammonium Bromide. NH_4Br=97.29.

It should contain not less than 97 per cent. of pure Ammonium Bromide, and should be kept in well-stoppered bottles.

SOURCE.—Made by neutralizing Hydrobromic Acid with Ammonia or Ammonium Carbonate, evaporating and crystallizing. $HBr + NH_4OH = NH_4Br + H_2O$.

CHARACTERS.—Colorless, transparent, prismatic crystals, or a white, crystalline powder, odorless, and having a pungent, saline taste. *Solubility.*—In 1.2 parts of water; in 12.5 parts of Alcohol; in 0.7 part of boiling water, and in 9 parts of boiling Alcohol.

IMPURITIES.—Ammonium iodide and bromate, iron, barium, heavy metals.

INCOMPATIBLES.—Spirit of nitrous ether, as well as the incompatibles mentioned under the other bromides.

2. **CALCII BROMIDUM.**—Calcium Bromide. $CaBr_2$=198.52.

It should contain not less than 97 per cent. of pure Calcium Bromide, and should be kept in well-stoppered bottles.

SOURCE.—From pure Calcium Carbonate by solution in Hydrobromic Acid, and evaporation. $CaCO_3 + 2HBr = CaBr_2 + CO_2 = H_2O$.

CHARACTERS.—A white, granular salt, odorless, and having a sharp, saline taste; very deliquescent. *Solubility.*—Very soluble in water, and in Alcohol.

IMPURITIES.—Iodides, calcium bromate, insoluble matters, barium, heavy metals, nitrates, ammonia.

Dose, 1 gm. (15 gr.).

3. **LITHII BROMIDUM.**—Lithium Bromide. LiBr = 86.34.

It should contain, when well dried, not less than 97 per cent. of pure Lithium Bromide, and should be kept in well-stoppered bottles.

SOURCE.—From a solution of Ferrous Bromide heated with Lithium Carbonate; when cool the solution is evaporated, and the salt obtained by crystallization. $FeBr_2 + Li_2CO_3 = 2LiBr + FeCO_3$.

CHARACTERS.—A white, granular salt, odorless, and having a sharp, slightly bitter taste; very deliquescent. *Solubility.*—In 0.6 part of water, and in 0.3 part of boiling water; very soluble in Alcohol; also soluble in Ether.

IMPURITIES.—Iodine, potassium, other alkalies, iron, aluminum, heavy metals.

Dose, 1 gm. (15 gr.).

4. POTASSII BROMIDUM.—Potassium Bromide. KBr=118.22.

It should contain not less than 97 per cent. of pure Potassium Bromide, and should be kept in well-stoppered bottles.

SOURCE.—By warming a solution of Potassium Hydroxide with Bromine a solution of the Bromide and Bromate is made. $3Br_2 + 6KOH = 5KBr + KBrO_3 + 3H_2O$. On evaporation to dryness, mixing the salts with Charcoal and heating to redness, the Bromate is reduced to a Bromide, while the Oxygen unites with the Carbon, forming Carbonic Oxide, which escapes. $KBrO_3 + 3C = KBr + 3CO$. Dissolving in water, the solution yields the Bromide in crystals.

CHARACTERS.—Colorless or white, cubical crystals, or a granular powder; odorless, and having a strongly saline taste. *Solubility.*—In about 1.5 parts of water and in about 180 parts of Alcohol; in less than 1 part of boiling water, and in 16 parts of boiling Alcohol; also soluble in Glycerin.

IMPURITIES.—Potassium bromate, iodides, heavy metals, barium, free alkali.

INCOMPATIBLES.—Acids, acid and metallic salts, alkaloids, chlorine water. The same incompatibles apply to the other bromides.

Dose, 1 gm. (15 gr.).

5. SODII BROMIDUM.—Sodium Bromide. NaBr = 102.24.

It should contain, when dried, not less than 97 per cent. of pure Sodium Bromide, and should be kept in well-stoppered bottles.

SOURCE.—Made from a solution of Sodium Hydroxide, as Potassium Bromide is made from a solution of Potassium Hydroxide.

CHARACTERS.—Colorless or white cubical crystals, or a white granular powder, odorless, and having a saline, slightly bitter taste. *Solubility.*—In about 1.7 parts of water; in 12.5 parts of Alcohol; in 0.8 part of boiling water, and in 11 parts of boiling Alcohol.

IMPURITIES.—Sodium bromate and iodide, heavy metals, barium, free alkali.

Dose, 1 gm. (15 gr.).

6. STRONTII BROMIDUM.—Strontium Bromide. $SrBr_2 + 6H_2O = 352.94$. It would contain not less than 97 per cent. of pure Strontium Bromide, and should be kept in glass-stoppered bottles.

SOURCE.—By neutralizing diluted Hydrobromic Acid with Strontium Carbonate, filtration and evaporation. $SrCO_3 + 2HBr = SrBr_2 + CO_2 + H_2O$.

CHARACTERS.—Colorless, transparent, hexagonal crystals, odorless, and

having a bitter, saline taste. Very deliquescent. *Solubility.*—In about 1 part of water, and in 0.4 part of boiling water. Readily soluble in Alcohol; insoluble in Ether.

IMPURITIES.—Barium, strontium iodide, heavy metals.

Dose, 1 gm. (15 gr.).

7. **ZINCI BROMIDUM.**—Zinc Bromide. $ZnBr_2 = 223.62$.

It should contain, when anhydrous, at least 97 per cent. of pure Zinc Bromide, and should be kept in small, glass-stoppered bottles.

SOURCE.—From granulated Zinc digested in Hydrobromic Acid; the solution is concentrated, acidulated with Hydrobromic Acid, and dried upon a water-bath. $Zn + 2HBr_2 = ZnBr_2 + H_2$.

CHARACTERS.—A white, or nearly white, granular powder, odorless, and having a sharp, saline and metallic taste; very deliquescent. Its aqueous solution is slightly acid in reaction. *Solubility.*—Readily in water and Alcohol.

IMPURITIES.—Zinc sulphate, iodide and chloride, arsenic, cadmium, lead, copper.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

ACTION.

The action of bromine closely resembles that of chlorine.

The bromides, in concentrated solution, are gastro-intestinal irritants. They are directly depressant to the cerebro-spinal axis, producing lassitude, drowsiness and sleep (which, however, is never very deep), with marked diminution of reflex irritability and of the respiratory and sexual functions. They are diuretic, especially the lithium salt, and are excreted mainly in the urine, but to some extent also in the perspiration and milk and probably by the bronchial and intestinal mucous membrane. Potassium bromide weakens the heart's action and is also more depressing to the central nervous system than the others. Lithium bromide is the richest in bromine and is thought to have the most pronounced hypnotic effect. The strontium and calcium salts are said to produce less digestive disturbance than those of the alkalies, but they appear to be absorbed more slowly. In bromism, or chronic poisoning, there are acne or other skin eruptions, a catarrhal condition of the mucous membranes, derangement of digestion, diminished sensibility, especially of the faucial mucous membrane, uncertain gait, dulled intellect, impairment of memory, and an apathetic expression of countenance.

Uses.

Bromine is at present very little used in medicine. Locally it has been employed with success as a caustic, but it causes great pain.

The bromides constitute our most valuable remedy for epilepsy, but as they must be continued for a long period, every effort should be made to minimize their injurious effects upon the system. They are much used also, either alone or in combination with other drugs, in the treatment of insomnia, nervousness, hysteria, neuralgia, migraine, delirium tremens, sea-sickness, seminal emissions, nymphomania, and various forms of convulsions. Except in cases of epilepsy they should not as a rule be given continuously very long, on account of the danger of the patient's contracting the bromide habit.

8. ACIDUM HYDROBROMICUM DILUTUM.—Diluted Hydrobromic Acid. A liquid composed of not less than 10 per cent., by weight, of absolute Hydrobromic Acid (HBr = 80.36) and about 90 per cent. of water. It should be kept in amber-colored, glass-stoppered bottles, protected from light.

Source.—Potassium Bromide, in solution, is mixed with Sulphuric Acid, and Potassium Sulphate allowed to crystallize, the precipitate is washed upon the filter, and the filtrate is distilled nearly to dryness and then diluted to the proper strength. $2KBr + H_2SO_4 = 2HBr + K_2SO_4$.

Characters.—A clear, colorless and odorless liquid, having a strongly acid taste, and miscible, in all proportions in water or Alcohol. Sp. gr., about 1.076.

Impurities.—Sulphuric and hydrochloric acids, chlorides, iodine, arsenic barium, heavy metals.

Dose, 4 c.c. (1 fl. dr.).

Action.

The same as that of the bromides, but, being more irritant, it is more apt to create gastric disturbance.

Uses.

But little used for the purposes of the bromides, but has some repute in preventing the untoward symptoms of quinine, of which it is a good solvent.

III. IODUM.

IODUM.—Iodine. I = 125.90. It should contain not less than 99 per cent. of pure Iodine, and be kept in glass-stoppered bottles, in a cool place.

SOURCE.—Obtained from the ashes of sea-weed and from the mother-liquor of Chilian Sodium Nitrate.

CHARACTERS.—Heavy, bluish-black, dry and friable rhombic plates, having a metallic lustre, a distinctive odor, and a sharp and acrid taste. Sp. gr., 4.948 at 17° C. (62.6° F.). *Solubility.*—In about 5000 parts of water; in 10 parts of Alcohol; freely in Ether, Chloroform, or Carbon Disulphide. Its solution in Alcohol or in an aqueous solution of Potassium Iodide has a reddish color, and its solution in Chloroform or Carbon Disulphide, a violet color.

IMPURITIES.—Iodine cyanide, chlorine, bromine.

INCOMPATIBLES.—Metallic salts, mineral acids, alkaloids, oil of turpentine, ammonia; with the last two explosive compounds may be formed.

Dose, 0.005 gm. = 5 milligm. ($\frac{1}{12}$ **gr.**).

Iodine is used to make Pilulæ Ferri Carbonatis.

Preparations.

1. **Liquor Iodi Compositus.**—Compound Solution of Iodine

Synonym.—Lugol's Solution. Iodine, 5; Potassium Iodide, 10; water to 100. *Strength.*—5 per cent.

Dose, 0.2 c.c. (3 ♏).

2. **Tinctura Iodi.**—Tincture of Iodine. Iodine, 70; Potassium Iodide, 50; Alcohol to 1000. *Strength.*—7 per cent.

Dose, 0.1 c.c. (1½ ♏).

3. **Unguentum Iodi.**—Iodine Ointment. Iodine, 4; Potassium Iodide, 4; Glycerin, 12; Benzoinated Lard, 80. *Strength.*—4 per cent.

ACTION.

Irritant, disinfectant, parasiticidal, absorbent, alterative. On the skin its first effect is a brownish discoloration. Its irritant action, while slow, is both penetrating and prolonged, and by repeated applications pronounced counter-irritation can be produced without deep destruction of tissue. As a result of its local application small quantities are absorbed. Minute doses have a tonic effect upon the stomach; large doses may cause gastro-enteritis. In animals it has been known to cause fatty degeneration of the heart, liver and kidneys. Its chief effects after absorp-

tion are due to its action on the thyroid gland, and the symptoms produced by its continued administration resemble those resulting from the use of thyroid extract. It is excreted chiefly by the kidneys, but also in the saliva, perspiration, bronchial secretion and milk.

Uses.

The official preparations are all comparatively mild, and are in general use as irritants, counter-irritants, and resolvents. "Iodine paint" is a tincture twice as strong as the official one. Iodine preparations are applied in a great variety of conditions, such as chronic inflammation of joints, periostitis, enlarged glands, buboes, chilblains, ringworm, pleurisy, and inflammation or retraction of the gums. Tincture of iodine may be injected into the sac of hydrocele, cysts, abscesses, dropsical joints, the pleural cavity, etc., but the practice is attended with some danger, as is also its parenchymatous injection in hypertrophied tonsil, goitre, glandular tumors, and the like. In some cases of spina bifida a successful result has been obtained by the injection of Morton's fluid, consisting of iodine, potassium iodide, and glycerin. Iodine preparations are of some value as inhalations in diseases of the respiratory tract. These remedies are not very much used internally, but the tincture, in minute doses, has sometimes proved of service in vomiting, in diarrhœa, and in passive intestinal hæmorrhage, and, combined with phenol, may be useful in typhoid fever. The compound solution has been recommended in scrofulous affections of the skin and of the lymphatic glands and in some old syphilitic skin diseases attended with thickening and scaling.

1. **AMMONII IODIDUM.**—Ammonium Iodide. $NH_4I = 143.83$.

It should contain not less than 97 per cent. of pure Ammonium Iodide, and should be kept in small amber-colored, well-stoppered vials, protected from light.

Source.—Dissolve Potassium Iodide and Ammonium Sulphate in boiling water, add Alcohol, filter, wash, and evaporate the filtrate to dryness. $2KI + (NH_4)_2SO_4 = 2NH_4I + K_2SO_4$.

Characters.—Minute, colorless, cubical crystals, or a white, granular

powder, odorless, and having a sharp, saline taste. It is very hygroscopic, and soon becomes yellow or yellowish-brown on exposure to the air and light, when it emits a slight odor of Iodine. *Solubility.*—In 0.6 part of water, and in 9 parts of Alcohol.

IMPURITIES.—Barium, iron, free iodine, chlorides, bromides, heavy metals.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

2. POTASSII IODIDUM.—Potassium Iodide. KI = 164.76.

It should contain not less than 99 per cent. of pure Potassium Iodide and should be kept in well-stoppered bottles.

SOURCE.—Dissolve Iodine in a hot solution of Potassium Hydroxide in distilled water. $3I_2 + 6KHO = 5\,KI + KIO_3 + 3H_2O$. Evaporate and heat the residue with Charcoal; the Oxygen of the Iodate is carried off as Carbonic Oxide. $KIO_3 + 3C = KI + 3CO$. Dissolve in boiling water, filter, wash and crystallize.

CHARACTERS.—Colorless, transparent, translucent, or opaque white, cubical crystals, or a white, granular powder, having a peculiar, faint, iodine-like odor, and a pungent, saline, afterwards bitter, taste. *Solubility.*—In 0.7 part of water; in about 12 parts of Alcohol; in 0.5 part of boiling water and 6 parts of boiling Alcohol; in 2.5 of Glycerin.

IMPURITIES.—Nitrates, nitrites, chlorides, bromides, potassium iodate, cyanide and thiosulphate, barium, free alkali.

INCOMPATIBLES.—Bismuth subnitrate, spirit of nitrous ether, mineral acids and acid salts, silver nitrate, soluble lead salts, potassium chlorate, alkaloids, licorice and preparations containing starch. The same incompatibles apply to the other iodides.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Potassium Iodide is contained in Unguentum Iodi.

Preparations.

1. Acidum Hydriodicum Dilutum.—Diluted Hydriodic Acid. A solution of Hydriodic Acid (HI = 126.9), containing not less than 10 per cent., by weight, of the absolute acid, and about 90 per cent. of water. It should be kept in amber-colored, glass-stoppered bottles, protected from the light.

SOURCE.—Potassium Iodide, 135; Potassium Hypophophite, 10; Tartaric Acid, 136.5; Distilled Water, Diluted Alcohol, each a sufficient quantity, to make 1000. By solution and evaporation.

CHARACTERS.—A clear, colorless liquid, odorless, and having an acid taste. Sp. gr., about 1.106. Miscible, in all proportions, with water or Alcohol.

IMPURITIES.—Arsenic, barium, heavy metals, sulphuric acid.

Dose, 0.5 c.c. (8 ♏).

2. Syrupus Acidi Hydriodici.—Syrup of Hydriodic Acid. A syrupy liquid containing about 1 per cent., by weight, of absolute Hydriodic Acid, or about 1.19 gm. in 100 c.c.

SOURCE.—Diluted Hydriodic Acid, 100; Water, 300; Syrup, 600.

CHARACTERS.—A transparent, colorless, or not more than a pale straw-colored liquid, odorless, and having a sweet and acidulous taste. Sp. gr., about 1.190.

IMPURITY.—Free iodine.

Dose, 4 c.c. (1 fl. dr.).

3. Unguentum Potassii Iodidi.—Ointment of Potassium Iodide. Potassium Iodide, 10; Potassium Carbonate, 0.6; water, 10; Benzionated Lard, 80.

3. SODII IODIDUM.—Sodium Iodide. $NaI = 148.78$.

It should contain not less than 98 per cent. of pure Sodium Iodide, and should be kept in well-stoppered bottles.

SOURCE.—Made from a solution of Sodium Hydroxide, as Potassium Iodide is made from a solution of Potassium Hydrohide. $3I_2 + 6NaHO = 5NaI + NaIO_3 + 3H_2O$.

CHARACTERS.—Colorless, cubical crystals, or a white crystalline powder, odorless, and having a saline and slightly bitter taste. *Solubility.*—In about 0.5 part of water; in about 3 parts of Alcohol; in 0.33 part of boiling water and 1.4 parts of boiling Alcohol.

IMPURITIES.—Potassium, heavy metals, sodium iodate, thiosulphate and cyanide, nitrates, nitrites, chlorides, bromides, free iodine, free alkali.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

4. STRONTII IODIDUM.—Strontium Iodide. $SrI_2 + 6H_2O = 446.02$.

It should contain not less than 98 per cent. of pure Strontium Iodide, and should be kept in glass-stoppered vials, carefully protected from light.

SOURCE.—By neutralization of freshly prepared solution of Hydriodic Acid with Strontium Carbonate; the filtrate is concentrated and the salt obtained by crystallization. $2HI + SrCO_3 = SrI_2 + CO_2 + H_2O$.

CHARACTERS.—Colorless, transparent, hexagonal plates, or white granular powder, or crystalline crusts; odorless, and having a bitter, saline taste. Deliquescent; colored yellow by exposure to air and light. *Solubility.*—In about 0.5 part water, and in 0.27 of boiling water; soluble in Alcohol; slightly in Ether.

IMPURITIES.—Barium, heavy metals.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

5. ZINCI IODIDUM.—Zinc Iodide. $ZnI_2 = 316.70$.

It should contain, when anhydrous, not less than 98 per cent. of pure Zinc Iodide, and should be kept in small glass-stoppered bottles, protected from light.

SOURCE.—By digesting an excess of Zinc with Iodine diffused in water. $Zn + I_2 + H_2O = ZnI_2 + H_2O$.

CHARACTERS.—A white, or nearly white, granular powder, odorless, and having a sharp, saline and metallic taste. Very deliquescent, and, upon exposure to air and light, becoming brown from liberated Iodine. *Solubility.*—Readily in water, Alcohol, or Ether.

IMPURITIES.—Arsenic, cadmium, lead, copper, zinc sulphate and chloride.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

ACTION.

Irritant, absorbent, alterative. Large doses of the iodides may cause gastric irritation; smaller doses, continued for some time, are apt to produce a series of symptoms known as Iodism. These may be divided into two groups: (1) Catarrh of the respiratory passages, with conjunctivitis and often severe headache; cutaneous eruptions; œdema of the face; neuralgia; singing in the ears; convulsive movements; disturbed intellection; rarely, atrophy of the breasts and testicles. (2) Iodic cachexia, characterized by rapid emaciation, with severe cardiac palpitation and ravenous appetite. The iodides are excreted mainly in the urine, but also in the secretions of the nasal mucous membrane and sebaceous glands and in the tears, sweat and milk. By the stomach small amounts are eliminated as hydriodic acid, and sometimes as free iodine. The urine is generally increased.

USES.

The iodides, of which the potassium salt is far more commonly employed than any of the others, are very frequently given in tertiary syphilis. In syphilis of the nervous system very large doses are called for. When the secondary stage of the disease is passing into the third, the "mixed treatment," consisting of potassium iodide and corrosive mercuric chloride, is very frequently given. In chronic rheumatic manifestations the iodides may be of service, and in so-called gonorrhœal rheumatism hydriodic acid is preferable to other preparations. In subacute catarrh of the duodenum and of the biliary ducts sodium or ammonium iodide has been recommended, and in the first stage of hepatic cirrhosis the latter salt combined with arsenic. Iodides

are used for the absorption of inflammatory products, as in joint disease and pleurisy, and among the other conditions in which they are employed are arteriosclerosis, interstitial nephritis, amyloid disease of the kidney and other organs, enlarged spleen, goitre, lead and mercury poisoning, and certain non-syphilitic diseases of the skin. Potassium iodide is sometimes efficient in relieving the symptom asthma, and ammonium iodide is highly esteemed in capillary and in chronic bronchitis.

GROUP II.

Oxygen, Water, Hydrogen Dioxide.

I. OXYGENIUM.—Oxygen (not official). O = 15.96.

SOURCE.—By exposing Manganese Dioxide with Potassium Chlorate to a strong heat. $2KClO_3 + \text{heat} = 2KCl + 3O_2$.

CHARACTERS.—A colorless, odorless gas, slightly soluble in water and alcohol.

Compressed oxygen gas is sold in metallic cylinders.

ACTION.

The inhalation of oxygen causes a sensation of warmth in the respiratory passages, and increases the appetite and the mental and bodily vigor. The red blood corpuscles are augmented in number and stimulated to greater activity.

USES.

Cardiac disease, pneumonia, pulmonary œdema, emphysema, convulsions, chloroform narcosis, asphyxia from toxic gases, and in various other conditions characterized by great lividity or by dyspnœa due to causes interfering with the oxygenation of the blood; also in chronic conditions such as anæmia, albuminuria, glycosuria, and phthisis.

II. AQUA.—Water. $H_2O = 17.88$.—Potable water in its purest attainable state.

CHARACTERS.—A colorless, limpid liquid, without odor or taste at ordinary temperatures, and odorless when heated.

IMPURITIES.—Soluble salts, sulphates, chlorides, nitrates, nitrites, ammonia and organic or other oxidizable substances.

III. AQUA DESTILLATA.—Distilled water.

SOURCE.—Take 1000 volumes of water, distil from a suitable apparatus provided with a block tin or glass condenser, reject the first 100 volumes, which contain volatile impurities, and preserve the next 800 in glass-stoppered bottles, rinsed with hot distilled water immediately before being filled.

CHARACTERS.—A colorless, limpid liquid, without odor or taste, and perfectly neutral to litmus paper.

TESTS.—When 1000 c.c. are evaporated on a water bath to dryness, not more than 0.075 gm. of *residue* should remain. On heating to boiling 100 c.c. acidulated with 10 c.c. of Diluted Sulphuric Acid, and adding 0.1 c.c. of tenth-normal Potassium Permanganate volumetric solution, the color of the liquid should not be completely destroyed by boiling for ten minutes, nor by afterwards setting the vessel aside, well covered, for ten hours (absence of *organic* or *other oxidizable matters*). Not the slightest turbidity should result upon the addition to separate portions, of Barium Chloride test solution (*sulphate*), Silver Nitrate t.s. (*chloride*), Ammonium Oxalate t.s. (*calcium*); nor should its transparency be affected when it is mixed with twice its volume of Calcium Hydroxide t.s. (absence of *carbonic acid*). It should not respond to the time limit test for *heavy metals*, nor should it give any reaction for nitrates, nitrites, or ammonia.

Aqua Destillata is always to be used for making up prescriptions.

ACTION.

In healthy persons a cold bath causes at first a feeling of great chilliness, owing to the blood being driven away from the surface; very soon reaction sets in, every portion of the body receives a more perfect supply of blood, and a feeling of exhilaration is experienced. A warm bath causes flushing of the skin, increases the frequency of the pulse and respiration, and is followed by profuse perspiration, while the excretion of urine is diminished. Taken in sufficient quantity, water washes out the system, and increases the urinary flow. Luke-warm water is an emetic, while hot water in small amounts, frequently repeated. tends to check vomiting.

USES.

Cold baths are employed in the treatment of febrile diseases, more particularly typhoid fever. It is important that frictions should be maintained all the time the patient is in the water. Various modifications of the full cold bath are also employed.

Ice-water baths are of great service in sunstroke, or thermic fever, and cold water may be injected into the bowel when the skin is cold but the central temperature high. Large injections of cold water are also useful in dysentery. Ice-bags are sometimes applied to various parts of the body for the purpose of controlling inflammatory action, and also for the hæmostatic effect of the cold. Warm baths are employed to soothe pain, alleviate muscular and mental fatigue, promote sleep, and relieve spasmodic conditions and internal congestion. Hot baths and the hot pack are useful in renal disease and uræmia, and in commencing colds, on account of the free diaphoresis they induce. Localized hot baths aid in the same way as general ones, but are less pronounced in their effects. In various painful affections of the eye much relief may be afforded by the application of hot water on cotton pledgets frequently renewed, or by allowing the water to drop continuously on the eye. Internally water is of great service in keeping the urine diluted, and its free use tends to prevent the formation of gall-stones, as well as of gravel or urinary calculi. A glass or two of water swallowed upon rising often has the effect of causing an evacuation of the bowels. Tepid water, sometimes with the addition of mustard, is very commonly used as an emetic.

IV. AQUA HYDROGENII DIOXIDI.—Solution of Hydrogen Dioxide.

A slightly acid, aqueous solution of Hydrogen Dioxide ($H_2O_2 = 33.76$), which should contain, when freshly prepared, about 3 per cent., by weight of absolute Hydrogen Dioxide, corresponding to about ten volumes of available Oxygen. It should be kept in a cool place. Upon removing the stopper from the bottle, not more than a slight pressure should be observed.

SOURCE.—A solution of Barium Dioxide, 300, in cold distilled water, 500, refrigerated to below 10° (50° F), is thoroughly mixed with the greater part of a cool solution of Phosphoric Acid, 96, in distilled water, 320; a certain portion of the latter solution being reserved to add from time to time to the liquid to render it acid whenever its reaction has become alkaline. Filter, and wash with distilled water. Add Diluted Sulphuric Acid to the filtrate, and starch, 10; by agitation. Filter and re-filter until a clear solution is obtained.

CHARACTERS.—A colorless liquid, without odor, slightly acidulous to the taste, and producing a peculiar sensation and soapy froth in the mouth;

liable to deteriorate by age, exposure to heat, or protracted agitation. If the stopper in the bottle be replaced by a pledget of cotton, deterioration is retarded. Sp. gr., about 1.006 to 1.012.

IMPURITIES.—Free acids, arsenic, heavy metals, barium, hydrofluoric acid.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

Hydrogen dioxide readily yields oxygen to all oxidizable substances. It is a non-poisonous and powerful antiseptic, but its germicidal activity is of comparatively short duration, ending as soon as all the oxygen is liberated. It decomposes pus, and probably destroys the microbes of suppuration. In the blood the oxygen set free by it has been known to cause the formation of emboli. When taken internally it gives oxygen to the blood, stimulates the nervous system, and increases the secretion of urine.

USES.

It is of great value in cleansing wounds, ulcers and fistulous tracts, and for surgical dressings; also in diphtheria as a cleansing agent and to absorb false membranes. It is more or less used in the treatment of gonorrhœa, leucorrhœa, chancre, tonsillitis, otorrhœa, ozæna and various eye diseases, and is stated to completely remove the black stains left by gunpowder burns if each point is pricked well open. Injected under the epidermis, it acts as a local anæsthetic, but this procedure is no doubt attended with the risk of causing embolism. Internally it may perhaps be of service in some forms of dyspepsia.

GROUP III.

Sulphur.

S = 31.83.

Sulphur is official in three forms.

1. **SULPHUR SUBLIMATUM.**—Sublimed Sulphur. *Synonym.*—Flowers of Sulphur. It should contain not less than 99 per cent. of pure Sulphur.

SOURCE.—From Crude Sulphur by sublimation.

CHARACTERS.—A fine, yellow powder, having a slight, characteristic odor and a faintly acid taste. *Solubility.*—Insoluble in water; readily in Carbon Disulphide; slightly in Absolute Alcohol; more readily in Petroleum Benzin, Benzene, Oil of Turpentine, and many other oils; also in Ether, Chloroform and boiling aqueous solutions of alkali hydroxides.

Dose, 4 gm. (60 gr.).

2. SULPHUR PRÆCIPITATUM.—Precipitated Sulphur. *Synonym.*—Milk of Sulphur. It should contain, when dried, not less than 99.5 per cent. of pure Sulphur.

SOURCE.—Boil Sublimed Sulphur, 100; with Slaked Lime, 50; in water. $6S_2 + 3Ca(OH)_2 = 2CaS_5 + CaS_2O_3 + 3H_2O$. This gives a solution containing Calcium Sulphide and Calcium Thiosulphate. To it Hydrochloric Acid is added, and Sulphur is thrown down as a very fine precipitate. $2CaS_5 + 4HCl = 2CaCl_2 + 4S_2 + 2H_2S$. Wash and dry the precipitate.

CHARACTERS.—A fine, amorphous powder of a pale yellow color, without odor or taste.

IMPURITIES.—Arsenic, acids, alkalies.

Dose, 4 gm. (60 gr.).

3. SULPHUR LOTUM.—Washed Sulphur. It should contain, when dried, not less than 99.5 per cent. of pure Sulphur.

SOURCE.—Sublimed Sulphur, 100; with water, 100, and Ammonia Water, 10; is digested for three days, when water, 100, is added, the mixture strained, and the Sulphur washed with water. It is then drained, and the residue pressed, dried, and passed through a sieve.

CHARACTERS.—A fine, yellow powder, without odor or taste.

IMPURITIES.—Acids, arsenic, ammonia, earthy and metallic impurities.

Dose, 4 gm. (60 gr.).

Washed Sulphur is contained in Pulvis Glycyrrhizæ Compositus, *and is used to make* Sulphuris Iodidum.

Preparation.

Unguentum Sulphuris.—Sulphur Ointment. Washed Sulphur, 150; Benzoinated Lard, 850.

ACTION.

Irritant, disinfectant, antiparasitic, laxative, diaphoretic, resolvent and alterative. Sulphur itself is inert, and its effects upon the system are due to the formation of sulphides and hydrosulphuric acid, or hydrogen sulphide. The latter is a powerful poison, with extremely irritant properties. The conversion of sulphur into sulphides is usually slow, and hence the irritation

produced by it is apt to be mild and prolonged. The sulphides, in contact with the skin, have a solvent action upon the horny epidermis and the hair. Absorption may take place from the skin, as well as the alimentary canal. When sulphur is taken by the mouth, much the larger portion of it passes through the intestines without change. The remainder is converted into sulphides, which form some hydrogen sulphide, and, after absorption into the blood, are rapidly oxidized and excreted principally by the kidneys, and to a small extent by the lungs. Hydrogen sulphide is eliminated in minute amount by the skin and also in the milk. In the intestine the sulphur compounds produce mild purgation and also have an antiseptic effect. Inject animals, the sulphides have a direct action on the central system. Convulsions are caused, and death results from tory failure and paralysis of the vasomotor centre. In sulphur is never given in sufficient quantity to elicit effects of its compounds upon the system.

Uses.

Sulphur ointment, preferably diluted, is an efficient r scabies. Sulphur is also employed externally for pedic the various forms of tinea, as well as chronic acn eczema, psoriasis, alopecia circumscripta, and other sk Many of the parasitic affections are best treated b sulphur-vapor baths. Ointments containing sulphur applied to the skin in scarlet fever, measles, small-p sipelas, and insufflations of powdered sulphur are made into the throat or nose in diphtheria and s The internal use of sulphur, in small doses, is of servi skin diseases. It is a very good laxative, especially and on account of the soft stools it produces it is u fistula, etc. It is thought to be beneficial in diso tions of the liver, and the various natural sulphu employed for these, as well as for chronic rheu poisoning, and skin diseases, including the late se tions of syphilis. They are used both internally a

4. CALX SULPHURATA.—Sulphurated Lime. *Synonym.*—Crude Calcium Sulphide. A mixture containing at least 55 per cent. of Calcium Sulphide ($CaS = 71.63$), together with unchanged Calcium Sulphate ($CaSO_4 = 135.15$), and Carbon, in varying proportions.

SOURCE.—Obtained by heating a mixture of Exsiccated Calcium Sulphate, 70; Charcoal, 10; and Starch, 2.

CHARACTERS.—A pale gray powder, exhaling a faint odor of Hydrogen Sulphide, having a nauseous, alkaline taste, and gradually decomposed by exposure to moist air. *Solubility.*—Very slightly in water; more readily in boiling water, which partially decomposes it; insoluble in Alcohol.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

5. SULPHURIS IODIDUM.—Sulphur Iodide. $SI = 158.51$.

SOURCE.—By heating washed Sulphur, 20, with Iodine, 80, to liquefaction; when solid after cooling, reduce the fused mass to pieces.

CHARACTERS.—Brittle masses of a crystalline fracture and a grayish-black, metallic lustre, having the odor of Iodine and a somewhat acrid taste. *Solubility.*—Almost insoluble in water; soluble in about 60 parts of Glycerin; very soluble in Carbon Disulphide.

ACTION.

Small doses of sulphurated lime act in a similar manner to sulphur, but occasion more irritation; large doses excite gastro-enteritis. In medicinal doses the action of sulphur iodide is essentially that of iodine.

USES.

Chronic eczema and psoriasis may be treated with warm baths containing sulphurated lime, and this substance is used also in weak ointments for chronic skin diseases and for scabies. An ointment of sulphur iodide is useful in ringworm and other skin diseases. Sulphurated lime, internally, is of service in preventing suppuration, and may be used for boils, carbuncles, the sores of scrofulous children, etc. The natural sulphide waters are regarded as beneficial in a variety of chronic disorders.

6. CARBONEI DISULPHIDUM.—Carbon Disulphide. $CS_2 = 75.57$. It should be kept in partially filled, well-stoppered bottles, or in tin cans, in a cool place, remote from lights or fire.

SOURCE.—By combination of Carbon and Sulphur, by distillation.

CHARACTERS.—A clear, colorless, highly refractive liquid, very diffusive, having a strong, characteristic, but not fetid, odor, and a sharp, aromatic

taste. Sp. gr., 1.256 to 1.257. *Solubility.*—In 526 parts of water; very soluble in Alcohol, Ether, Chloroform, and fixed and volatile oils.

IMPURITIES.—Sulphur dioxide, dissolved sulphur, hydrogen sulphide.

ACTION.

It is a powerful poison, and persons exposed to its fumes are apt to be affected with headache, vertigo, anæmia, disturbed sensation, physical and mental debility, and in some cases epileptiform convulsions. Inhaled directly, it excites violent coughing and produces anæsthesia characterized by marked muscular rigidity. In small doses by the mouth it causes nausea and vomiting and a weak and rapid heart action.

USES.

It is principally used as a solvent for rubber and similar bodies. In minute doses it is said to relieve gastralgia and the pain of gastric cancer, as well as nausea and vomiting. It can be freed from its usual disgusting odor by rectification.

GROUP IV.

Phosphorus, Arsenic, Antimony.

I. PHOSPHORUS.

P = 30.77.

It should contain not less than 99.5 per cent. of pure Phosphorus, and be carefully kept under water, in strong, well-closed vessels, in a secure and moderately cool place, protected from light.

SOURCE.—Treat Bone Ash or Lime Phosphate with Sulphuric Acid and water, filter and evaporate. $Ca_3(PO_4) + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$. Heat and Acid Calcium Phosphate thus formed, with Charcoal and sand. The heat first forms Calcium Metaphosphate. $CaH_4(PO_4)_2 = Ca(PO_3)_2 + 2H_2O$. This is acted on by the Charcoal and sand thus: $2Ca(PO_3)_2 + 2SiO_2 + 10C_2 = 2CaSiO_3 + 10CO + P_4$.

CHARACTERS.—A translucent, nearly colorless solid, of a waxy lustre, having, at ordinary temperatures, about the consistence of beeswax. By long keeping the surface becomes white or red, and occasionally black. It has a distinctive and disagreeable odor and taste (*but should not be tasted except in very dilute solution*). When exposed to the air it emits white fumes, which are luminous in the dark, and have an odor somewhat resembling garlic; on longer exposure to air it often takes fire spontaneously. Heated

with Hydrogen, it becomes red, amorphous, non-poisonous Phosphorus. Sp. gr., 1.830 at 10° C. (50° F.) and 1.820 at 25° C. (77° F.). *Solubility.*—Freely in Carbon Disulphide; in about 25 parts of Chloroform, 50 parts of any fatty oil, 80 parts of Absolute Ether, and 240 parts of Absolute Alcohol; insoluble, or nearly so, in water.

IMPURITIES.—Arsenic, sulphur.

INCOMPATIBLES.—All oxidizers, as potassium chlorate and permanganate, chlorine, hydrochloric acid, etc.

Dose, 0.0005 gm. = 0.5 milligm. ($\frac{1}{120}$ **gr.**).

Preparation.

Pilulæ Phosphori.—Pills of Phosphorus. Add Phosphorus, .06, dissolved in Chloroform, to a mixture of Althea, 6, and Acacia, 3; then add a sufficient quantity of a mixture of Glycerin, 2 volumes, and water, 1 volume, to make 100 pills. Finally the pills are coated with a solution of Balsam of Tolu, 10 gm., in Ether, 15 c.c. *Strength.*—Each pill contains .0006 gm. ($\frac{1}{100}$ gr.) of Phosphorus.

Dose, 1 pill.

ACTION.

Irritant, tonic, stimulant to the bone-forming cells and the nervous system; diminishes tissue waste. Small doses increase the number of red blood corpuscles. It is in part probably oxidized to phosphoric acid. Some of it is excreted by the lungs and some by the kidneys.

USES.

Phosphorus is especially indicated in osteomalacia, rickets, and ununited fractures, and is of value in convalescence from exhausting diseases, nervous exhaustion, neuralgia dependent upon debility, alcoholism, sexual exhaustion, and various suppurative diseases.

Toxicology.—Burning pain in abdomen, nausea and vomiting of matters having a garlic-like odor. Patient may die in collapse, but usually recovers from the first effects and may appear quite well for perhaps three or four days. Then he is taken with severe abdominal pain, vomiting and diarrhœa, the vomit and stools often containing blood. Marked jaundice, from fatty degeneration of the liver; intense thirst, muscular weakness and pain, small and quick pulse; general prostration; hæmorrhages in different situations from fatty degeneration of muscular coat of smaller arteries; the urine may contain blood, albumin, and sarcolactic acid (the last regarded at diagnostic

of phosphorus poisoning); towards the end, convulsions and coma. *Post-mortem.*—Wide-extended fatty degeneration, most marked in the liver; numerous hæmorrhages and ecchymoses. *Treatment.*—Emetics or washing out the stomach, cathartics, potassium permanganate, inhalations of oxygen, hydrogen dioxide by the mouth. Oily or fatty substances only aid the absorption of the poison, but old, ozonized oil of turpentine is regarded as antidotal. In secondary stage, alkalies to neutralize sarcolactic acid in the tissues.

1. **CALCII HYPOPHOSPHIS.**—Calcium Hypophosphite. $Ca(PH_2O_2)_2 = 168.86$. It should contain not less than 98 per cent. of pure Calcium Hypophosphite [$(PO \cdot OH_2)_2$ Ca], and should be kept in well-stoppered bottles. Caution should be observed in dispensing this and other hypophosphites, as explosion is liable to occur when they are triturated with nitrates, chlorates, or other oxidizing agents. All the hypophosphites explode when heated.

SOURCE.—Heat Phosphorus with Milk of Lime. Then pass Carbon Dioxide through the liquid to remove the excess of Lime. The Hypophosphite crystallizes out of the solution. $3Ca(OH)_2 + 4P_2 + 6H_2O = 3Ca(PH_2O_2)_2 + 2PH_3$.

CHARACTERS.—Colorless, transparent, monoclinic prisms, or small, lustrous scales, or a white, crystalline powder, odorless and having a nauseous, bitter taste. *Solubility.*—In 6.5 parts of water; insoluble in Alcohol.

IMPURITIES.—Calcium phosphate and sulphate, arsenic, heavy metals.

INCOMPATIBLES.—Arsenic salts, bromine and bromates, chlorine and chlorates, chromates, copper salts, ferric salts, iodine and iodates, nitric acid, permanganates, sulphuric and sulphurous acids. The same incompatibles apply to the other Hypophosphites and to Diluted Hypophosphorous Acid.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

2. **FERRI HYPOPHOSPHIS.**—Ferric Hypophosphite. $Fe(PH_2O_2)_3 = 249.09$. It should contain not less than 98 per cent. of pure Ferric Hypophosphite [$(PH_2O \cdot O)_3Fe$], and should be kept in well-stoppered bottles.

SOURCE.—A solution of Sodium Hypophosphite is added to a solution of Ferric Chloride; the precipitate is washed and dried with moderate heat. $3NaPH_2O_2 + FeCl_3 = Fe(PH_2O_2)_3 + 3NaCl$.

CHARACTERS.—A white, or grayish-white powder, odorless, and nearly tasteless. *Solubility.*—Only slightly soluble in water; more readily soluble in the presence of Hypophosphorous Acid, or in a warm, concentrated solution of an alkali citrate, forming with the latter a green solution.

IMPURITIES.—Ferrous carbonate, ferric phosphate, calcium, heavy metals.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

3. **MANGANI HYPOPHOSPHIS.**—Manganese Hypophosphite. $Mn(PH_2O_2)_2 + H_2O = 201.54$.

It should contain not less than 97 per cent. of pure Manganese Hypo-

phosphite [$(PH_2O \cdot O)_2$ Mn + H_2O], and should be kept in well-stoppered vials.

SOURCE.—Add Manganese Sulphate to a solution of Lime Hypophosphite, and evaporate the filtrate $Ca(PH_2O_2)_2 + MnSO_4 = Mn(PH_2O_2)_2 + CaSO_4$.

CHARACTERS.—A pink, crystalline powder, odorless and nearly tasteless. *Solubility.*—In 6.6 parts of water and 6 of boiling water; almost insoluble in Alcohol.

IMPURITIES.—Manganese carbonate and phosphate, calcium, arsenic.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

4. POTASSII HYPOPHOSPHIS.—Potassium Hypophosphite. $KPH_2O_2 = 103.39$. It should contain not less than 98 per cent. of pure Potassium Hypophosphite ($PO \cdot H_2OK$), and should be kept in well-stoppered bottles.

SOURCE.—From double decomposition of Calcium Hypophosphite and Potassium Carbonate; the Potassium Hypophosphite remains in solution. $Ca(PH_2O_2)_2 + K_2CO_3 = CaCO_3 + 2KPH_2O_2$.

CHARACTERS.—White, opaque, hexagonal plates, or crystalline masses, or a granular powder, odorless, and having a pungent, saline taste. Very deliquescent. *Solubility.*—In 0.5 part of water and 7 parts of Alcohol; in 0.3 part of boiling water and 3.6 parts of boiling Alcohol; insoluble in Ether.

IMPURITIES.—Potassium carbonate, arsenic, heavy metals.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

5. SODII HYPOPHOSPHIS.—Sodium Hypophosphite. $NaPH_2O_2 + H_2O = 105.29$. It should contain not less than 98 per cent. of pure Sodium Hypophosphite ($PO \cdot H_2 \cdot ONa + H_2O$), and should be kept in well-stoppered bottles.

SOURCE.—Add Sodium Carbonate to a solution of Calcium Hypophosphite, and evaporate the filtrate. $Ca(PH_2O_2)_2 + Na_2CO_3 = CaCO_3 + 2NaPH_2O_2$.

CHARACTERS.—Small, colorless, transparent, rectangular plates of a pearly lustre, or a white granular powder, odorless, and having a bitterish-sweet, saline taste. Very deliquescent on exposure to moist air. *Solubility.*—In about 1 part of water and 25 parts of Alcohol; in 0.12 part of boiling water and 1 part of boiling Alcohol.

IMPURITIES.—Calcium, sodium carbonate, caustic alkali, arsenic, heavy metals.

Dose, 1 gm. (15 gr.).

Calcium, Potassium and Sodium Hypophosphites are contained in Emulsum Olei Morrhuæ Cum Hypophosphitibus.

6. ACIDUM HYPOPHOSPHOROSUM.—Hypophosphorous Acid. A liquid composed of 30 per cent., by weight, of absolute Hypophosphorous Acid [$PO \cdot H_2(OH) = 65.53$], and 70 per cent. of water.

SOURCE.—Heat Phosphorus with solution of Potassium or Sodium Hydrox-

ide; the hypophosphite thus obtained is decomposed with Sulphuric or Tartaric Acid; filter the concentrated solution, and concentrate under the air-pump (heat decomposes it) until the desired strength is reached.

CHARACTERS.—A colorless, odorless, acid liquid. Sp. gr., about 1.130.

IMPURITIES.—Potassium, barium, arsenic and phosphoric, sulphuric, oxalic and tartaric acids.

7. **ACIDUM HYPOPHOSPHOROSUM DILUTUM.**—Diluted Hypophosphorous Acid. A liquid composed of 10 per cent., by weight, of absolute Hypophosphorous Acid, and 90 per cent. of water.

SOURCE.—Hypophosphorous Acid, 200; Distilled Water, 400.

CHARACTERS.—A colorless liquid, without odor, and having an acid taste. Sp. gr., about 1.042. *Solubility.*—Miscible, in all proportions, with water.

Dose, 0.5 c.c. (8 ♏).

Diluted Hypophosphorous Acid is used in Syrupus Ferri Iodidi.

Preparations.

1. **Emulsum Olei Morrhuæ Cum Hypophosphititus.** *See* Cod Liver Oil.

2. **Syrupus Hypophosphitum.**—Syrup of Hypophosphites. Calcium Hypophosphite, 45; Potassium Hypophosphite, 15; Sodium Hypophosphite, 15; Diluted Hypophosphorous Acid, 2; Tincture of Fresh Lemon Peel, 5; sugar, 650; and sufficient water to make 1000.

Dose, 8 c.c. (2 fl. dr.).

3. **Syrupus Hypophosphitum Compositus.**—Compound Syrup of Hypophosphites. Calcium Hypophosphite, 35; Potassium Hypophosphite, 17.50; Sodium Hypophosphite, 17.50; Ferric Hypophosphite, 2.25; Manganese Hypophosphite, 2.25; Quinine, 1.10; Strychnine, 0.115; Sodium Citrate, 3.75; Diluted Hypophosphorous Acid, 15; Sugar, 775; and sufficient water to make 1000.

Dose, 8 c.c. (2 fl. dr.).

ACTION.

The hypophosphites do not appear to be oxidized to phosphates in the tissues, as was formerly supposed to be the case, and there is little experimental evidence of their value. As regards ferric hypophosphite, however, its metallic iron no doubt constitutes an important element in its effect.

USES.

Notwithstanding the negative evidence as to their physiological activity, these agents are extensively used in cachectic con-

ditions, and especially tuberculosis. When used intelligently in the latter they will improve nutrition and relieve some of the symptoms. They should be of chemical purity and neutral in reaction. It is better to administer a single hypophosphite than a combination, as in the official syrup. The potassium salt is a valuable expectorant in chronic bronchitis.

Unofficial Preparations.

Calcii Glycerophosphas. — Calcium Glycerophosphate. The Calcium Salt of Glycerophosphoric Acid.

SOURCE.—Phosphoric Acid, 30, mixed with Glycerin, 36, is kept at a little above normal body temperature for six days, being shaken several times daily. On the seventh day it is cooled, and its acidity gradually and completely neutralized with Calcium Carbonate. After two days the solution is filtered, and the salt precipitated by Alcohol. The precipitate is dissolved in cold water, the solution filtered and evaporated to dryness at a low temperature.

CHARACTERS.—A white, crystalline powder. *Solubility.*—In 20 parts of water, almost insoluble in boiling water, and insoluble in Alcohol.

Dose, .30 to 1.00 gm.; 5 to 15 gr.

Sodii Glycerophosphas. — Sodium Glycerophosphate. The Sodium salt of Glycerophosphoric Acid.

SOURCE.—By a method similar to that given above, a Sodium being substituted for a Calcium Salt.

CHARACTERS.—A white, crystalline powder which is so hygroscopic that this salt appears in commerce only as a 75 per cent. solution in water.

Dose, .60 to 2.00 c.c.; 10 to 30 ♏, usually hypodermatically.

Potassium Glycerophosphate (not official) is similar in physical appearance to the Sodium Salt. Iron, Lithium and Magnesium Glycerophosphates (none official) are fine, white, soluble powders.

ACTION.

Improve the nutrition of all organs, but more particularly that of the nervous system.

USES.

The indications for the glycerophosphates are conditions of nerve depression. If given subcutaneously they are at least as efficacious as testicular fluid, which owes its activity to its contained organic phosphates, and they possess the advantage of

more accurate dosage. Useful in various neuralgias, in Addison's disease, and in the symptom-complex known as neurasthenia. Chlorosis, albuminuria, phosphaturia, and anæmia (the latter by the iron salt) have been benefited. In diabetes the general condition improves and the amount of sugar may diminish. The use of glycerophosphates is based on the ground that they contain phosphorus in the same state as it exists in the nerve tissues of the body; constituting, therefore, a natural form of administering phosphorus, which is at once assimilated without change.

II. ARSENUM.

As=74.4.

Arsenic is a perfect analogue of Phosphorus. In its free state it is similar to metals.

1. **ARSENI TRIOXIDUM.**—Arsenic Trioxide. $As_2O_3 = 196.44$. *Synonyms.*—Arsenous Acid. White Arsenic. It should contain not less than 99.8 per cent. of pure Arsenic Trioxide.

SOURCE.—Arsenical ores are roasted and purified by sublimation.

CHARACTERS.—A heavy solid, occurring either as an opaque, white powder, or in irregular masses of two varieties: one amorphous, transparent and colorless, like glass; the other crystalline, opaque and white, resembling porcelain. *Caution should be used in tasting this and other arsenical compounds, as they are very poisonous. Solubility.*—In 30 to 100 parts of cold, in 15 parts of boiling water; in 5 parts of Glycerin; sparingly in Alcohol; freely in Hydrochloric Acid and in solutions of alkali hydroxides and carbonates.

IMPURITIES.—Arsenic acid, arsenous sulphide, tin, antimony, cadmium.

INCOMPATIBLES.—Hypophosphorous acid, copper, iron and silver salts, lime water, magnesia, potassium iodide, vegetable astringents. The same incompatibles apply to the Arsenites.

Dose, 0.002 gm. = 2 milligm. ($\frac{1}{30}$ gr.).

Preparations.

1. **Liquor Acidi Arsenosi.**—Solution of Arsenous Acid. Arsenic Trioxide 10, is boiled with Diluted Hydrochloric Acid, 50, and distilled water to make 1000. No decomposition occurs, but an acid solution of Arsenic Trioxide is formed. *Strength.*—1 per cent. of Arsenic Trioxide.

Dose, 0.2 c.c. (3 ♏).

2. Liquor Potassii Arsenitis.—Solution of Potassium Arsenite. *Synonym.*—Folwer's solution. Arsenic Trioxide, 10; Potassium Bicarbonate, 20; Compound Tincture of Lavender, 30; sufficient distilled water to make 1000. The Compound Tincture of Lavender is added after the Arsenic Trioxide and Potassium Bicarbonate have been dissolved by boiling with distilled water, 100, and sufficient distilled water has been added to make 730. The following equation expresses the chemical reaction which takes place: $As_2O_3 + 4KHCO_3 = 2K_2HAsO_3$. *Strength.*—1 per cent. of Arsenic Trioxide.

Dose, 0.2 c.c. (3 ♏).

2. SODII ARSENAS.—Sodium Arsenate. $Na_2HAsO_4 + 7H_2O = 309.84$. It should contain in an uneffloresced condition not less than 98 per cent. of pure Di-sodium-ortho-arsenate [$AsO(OH)(ONa)_2 + 7H_2O$], and should be kept in well-stoppered bottles.

SOURCE.—Heat to redness Arsenic Trioxide, Sodium Nitrate, and Sodium Carbonate; dissolve the fused mass in water and crystallize. Sodium Pyroarsenate is formed. $As_2O_3 + 2NaNO_3 + Na_2CO_3 = Na_4As_2O_7 + N_2O_3 + CO_2$. On adding water to the Pyroarsenate, a solution of Sodium Arsenate, which crystallizes on standing, is formed. $Na_4As_2O_7 + H_2O = 2Na_2HAsO_4$, which crystallizes with $7H_2O$.

CHARACTERS.—Colorless, transparent, monoclinic prisms, odorless, and having a mild alkaline taste. *Solubility.*—In 1.2 parts of water; very soluble in boiling water; very sparingly soluble in cold, and nearly insoluble in boiling, Alcohol.

IMPURITIES.—Sodium arsenite, lead, copper, iron, etc.

Dose, 0.005 gm. = 5 milligm. ($\frac{1}{12}$ **gr.**).

Preparations.

1. Liquor Sodii Arsenatis.—Solution of Sodium Arsenate. *Synonym.*—Pearson's solution. (Pearson's solution is really only about one-tenth as strong as the official Liquor Sodii Arsenatis.)

SOURCE.—Dissolve Exsiccated Sodium Arsenate, 1, in sufficient distilled water to make 100. *Strength.*—1 per cent. of Exsiccated Sodium Arsenate.

Dose, 0.2 c.c. (3 ♏).

2. Sodii Arsenas Exsiccatus.—Exsiccated Sodium Arsenate ($Na_2HAsO_4 = 184.68$). It should contain not less than 98 per cent. of pure anhydrous Di-sodium-ortho-arsenate.

SOURCE.—Break crystals of Sodium Arsenate into small fragments, and allow them to effloresce at a temperature between 40° and 50° C. (104 and 122° F.) until they are completely disinte-

grated; gradually increase the temperature to 150° C. (302° F.), and continue the drying until the product ceases to lose weight; then reduce to a fine powder.

CHARACTERS.—An amorphous white powder, odorless, and having a mildly alkaline taste. *Solubility.*—In 3 parts of water; to the same extent as Sodium Arsenate in other menstrua.

Dose, 0.003 gm. = 3 milligm. ($\frac{1}{20}$ gr.).

3. ARSENI IODIDUM.—Arsenous Iodide. $AsI_3 = 452.10$.

It should contain not less than 82.7 per cent. of Iodine and 16.3 per cent. of metallic Arsenic. It should be kept in amber-colored, glass-stoppered bottles, in a cool place, carefully protected from the light.

SOURCE.—Made by the direct union of Iodine and Metallic Arsenic, or by mixing solutions of Arsenous and Hydriodic Acids, and evaporating.

CHARACTERS.—An orange-red, inodorous, crystalline powder. *Solubility.*—In about 12 parts of water (with partial decomposition); in about 28 parts of Alcohol; completely soluble in Chloroform, Ether, or Carbon Disulphide.

Dose, 0.005 gm. = 5 milligm. ($\frac{1}{12}$ gr.).

Preparation.

Liquor Arseni et Hydrargyri Iodidi. *See* Mercury.

Unofficial Preparations.

1 Acidum Cacodylicum.—Cacodylic Acid. $AsO(CH_3)_2OH$.

SOURCE.—This is arsenic Acid, $AsO(OH_2)$, in which two hydroxyls (OH) are replaced by two molecules of the methyl group (OH_3). It contains a large proportion of Arsenic (54.3 per cent.). The solution, acidulated with Hydrochloric Acid, should not form Arsenic Sulphide when treated with Sulphuretted Hydrogen, and it should not be reduced in contact with pure metalic Zinc, without heat.

CHARACTERS.—Well-defined crystals, faintly acid, tasteless and nearly odorless; freely soluble in water.

Dose, .24 gm.; 4 gr.

2. Sodii Cacodylas.—Sodium Cacodylate. $As(CH_5)_2O_2Na$.

SOURCE.—Obtained by neutralizing the acid solution with Sodium Bicarbonate.

CHARACTERS.—Soluble in water, highly deliquescent, and extremely stable; remaining unchanged when treated with either boiling Nitric Acid or a boiling mixture of Sulphuric Acid and Potassium Chromate.

Dose, .05 to .15 gm.; $\frac{3}{4}$ to 2$\frac{1}{2}$ gr., hypodermatically.

3. Ferri Arsenas.—*See* Iron.

Action.

Arsenic is not a general protoplasmic poison. It has the property of preserving animal tissues almost indefinitely. Toxic doses of arsenical preparations give rise to an acute gastro-enteritis, but the corrosion due to it is seldom extensive, and, no matter how the poison is introduced into the body, the first and most marked effects are in the intestine. Here there are produced a fatty degeneration of the epithelial coat and an exudation which, having caused the throwing off of the epithelium in shreds, is poured out into the gut, with the production of a profuse diarrhœa with "rice-water" stools. In therapeutic doses arsenic acts as a stimulant to the gastric and duodenal secretions, improving the appetite and digestion. In arsenical poisoning there is an early and marked fall of blood-pressure, and the heart is directly depressed. The respiration is affected only at a later period. The drug is excreted in all the secretions, but mainly by the kidney, and the process is a very slow one. The fatty degeneration which characterizes its action on the intestinal mucous membrane is also found in the liver, kidney and other organs.

Uses.

Arsenous acid was formerly much used as a caustic for destroying growths of various kinds. In commencing a course of arsenical treatment the dose at first should always be small, and it is important that as a rule the drug should be taken after meals. In some cases of vomiting and of irritative dyspepsia, however, it is preferable to give it before eating. Arsenic is useful to improve the digestion and general nutrition, and may be of service in gastric ulcer and cancer, and some forms of diarrhœa. Next to quinine, arsenic is the most reliable remedy for malarial infection, and it is often valuable in anæmia and chlorosis and in nervous disorders, especially chorea. In chronic bronchitis and other respiratory disorders and in some cases of organic heart disease it is also beneficial. One of its most useful and general applications is in the treatment of cutaneous affec-

tions of many varieties, especially when the acute inflammatory stage is past. Cacodylic acid and sodium cacodylate have recently been brought forward as eligible methods for the administration of arsenic; their solubility, relatively small toxicity, and the diminished local irritation which they produce are advantages to be borne in mind.

Toxicology.—Difficulty of swallowing, intense abdominal pain, faintness, nausea, excessive vomiting, profuse watery diarrhœa, muscular cramps, headache and dizziness, collapse, coma. Death may or may not be preceded by convulsions. *Treatment.*—Emetics or stomach-washing; freshly prepared ferric hydroxide with magnesium oxide, humid ferric hydroxide, or dialyzed iron; if neither of these can be obtained, magnesia; for the collapse, brandy subcutaneously. *Chronic poisoning.*—Skin eruptions, abdominal pain, loss of appetite, nausea, indigestion, diarrhœa, puffiness of the eye-lids, injection of the conjunctiva, watering of the eyes and nose, falling of the hair, polyneuritis, in some cases swelling of the liver, with jaundice.

III. ANTIMONIUM.

Sb = 119.3.

Antimony is analogous to Phosphorus and Arsenic. So far as its physical properties go, it is a metal.

ANTIMONII ET POTASII TARTRAS.—Antimony and Potassium Tartrate. $2K(SbO)C_4H_4O_6 + H_2O = 659.80$. *Synonyms.*—Tartar Emetic. Tartarated Antimony. It should contain not less than 99.5 per cent. of pure Antimony and Potassium Tartrate [$2C_2H_2(OH)_2(COOK)COOSbO + H_2O$].

SOURCE.—Make a paste of Antimony Trioxide (Sb_2O_3) with Acid Potassium Tartrate and water. Let it stand twenty-four hours, boil in water, and crystallize. $2KHC_4H_4O_6 + Sb_2O_3 = 2K(SbO)C_4H_4O_6 + H_2O$.

CHARACTERS.—Colorless, transparent crystals of the rhombic system, becoming opaque and white on exposure to air, or a white, granular powder, without odor, and having a sweet, afterwards disagreeable, metallic taste. *Solubility.*—In 15.5 parts of water and in 3 parts of boiling water; insoluble in Alcohol.

IMPURITIES.—Sulphate and chloride, potassium bitartrate, calcium, arsenic, iron, heavy metals.

INCOMPATIBLES.—Gallic and tannic acids, most astringent infusions, alkalies, lead salts.

Dose (expectorant), **0.005 gm. = 5 milligm.** ($\frac{1}{10}$ **gr**); (emetic), **0.030 gm. = 30 milligm.** ($\frac{1}{2}$ **gr.**).

Preparations.

1. Syrupus Scillæ Compositus.—Compound Syrup of Squill. *Synonym.*—Hive Syrup, so called from hives, the old name of croup. Fluidextract of Squill, 80; Fluidextract of Senega, 80; Antimony and Potassium Tartrate, 2; Sugar, 750; Purified Talc, 20; water to 1000.

Dose, 2 c.c. (30 ♏).

2. Vinum Antimonii.—Wine of Antimony. Antimony and Potassium Tartrate, 4; boiling distilled water, 65; Alcohol, 175; White Wine to 1000.

Dose, 1 c.c. (15 ♏).

Wine of Antimony is contained in Mistura Glycyrrhizæ Composita.

Action.

Irritant, emetic, diaphoretic, expectorant, powerfully depressant to heart and nervous system. In large doses by the mouth, or if injected into the circulation, its effects are practically identical with those of arsenic, but vomiting is always a prominent symptom. This is due to its effect as a gastric irritant, and the intestine may possibly remain unaffected, as antimony is absorbed more slowly than arsenic and the larger portion of the poison may be gotton rid of by the violent emesis excited. The sweat, the saliva and the mucous secretion of the respiratory tract are increased. The prolonged use of the drug is liable to cause fatty degeneration of many organs. It is excreted into the stomach and intestine, in the urine, and also probably in the bile and milk.

Uses.

The use of tartar emetic is now almost entirely confined to diseases of the respiratory passages. When a free secretion of mucus has once been established, it should, as a rule, be discontinued. Also, on account of its depressant properties, it is not a suitable preparation for infants or very young children. When an emetic is required in acute inflammations of the respiratory tract, ipecacuanha is usually preferable. As a diaphoretic it has been largely supplanted by pilocarpine.

Toxicology.—Emetics seldom required; cathartics; tannic acid repeatedly (strong tea is excellent); mucilaginous drinks; stimulants subcutaneously.

GROUP V.

Carbon.

CARBO.

C = 11.91.

1. **CARBO ANIMALIS.**—Animal Charcoal. Charcoal prepared from bone. *Synonym.*—Boneblack.

SOURCE.—Expose bones, deprived of fat, in iron cylinders, to red heat without access of air, and then powder them.

CHARACTERS.—Dull black, granular fragments, or a dull black powder; odorless, and nearly tasteless. ***Solubility.***—Insoluble in water or Alcohol.

2. **CARBO ANIMALIS PURIFICATUS.**—Purified Animal Charcoal.

SOURCE.—Digest Animal Charcoal, 100; with Hydrochloric Acid, 300, and a sufficient quantity of boiling water. Filter, wash and heat the residue to redness in a closed crucible.

CHARACTERS.—A dull black powder, odorless, tastless, and insoluble in water or Alcohol.

IMPURITIES.—Silicates and other fixed inorganic matter.

3. **CARBO LIGNI.**—Charcoal. *Synonym.*—Wood Charcoal.

Charcoal prepared from soft wood, and very finely powdered. It should be kept in well-closed vessels.

SOURCE.—Wood charred without access of air.

CHARACTERS.—A black, odorless, and tastless powder, free from gritty matter.

INCOMPATIBLES.—All oxidizers.

Dose, 1 gm. (15 gr.).

ACTION.

Charcoal is an oxidizing agent and deodorant. When it is brought into contact with decomposing organic matter it absorbs the gases, while the oxygen which it contains effects the oxidation of the matter to its simplest combinations. In addition to the absorption of gases, it has the property of absorbing many colloid bodies, such as the coloring matter of plants and proteids. It is not germicidal or antiseptic.

USES.

By its absorbent and oxidizing power it may check meteorism and flatulence, and by its mechanical action on the intestinal walls may serve as a mild laxative. Externally it is a cheap and

efficient deodorant and absorbent. As it is very dirty, when applied to cancerous sores, foul ulcers, etc., it is advisable to place it in thin bags of fine texture. In pharmacy it is useful as a decolorizing agent and for filtering, but charcoal filters are objectionable in the household, because, unless renewed very frequently, they not only lose their virtues but may become breeding-places for infectious germs.

II. PETROLATUM.

1. PETROLATUM.—Petrolatum. A mixture of Hydrocarbons, chiefly of the Methane series.

SOURCE.—Obtained by distilling off the lighter and more volatile portions from Petroleum, and purifying the residue.

CHARACTERS.—An unctuous mass, of about the consistence of an ointment, varying in color from yellowish to light amber; having but a slight fluorescence; transparent in thin layers; completely amorphous; without odor or taste, but giving off, when heated, a faint odor of Petroleum. Sp. gr., 0.820 to 0.850 when it is liquefied and brought to a temperature of 60° C. (140° F.). *Solubility.*—Insoluble in water; scarcely soluble in cold or hot Alcohol, or in cold Absolute Alcohol; but soluble in boiling Absolute Alcohol, and readily soluble in Ether, Chloroform, Carbon Disulphide, Oil of Turpentine, Petroleum Benzin, Benzene, and fixed or volatile oils.

IMPURITIES.—Rosin, fixed oils and fats of animal or vegetable origin, readily carbonizable organic impurities.

2. PETROLATUM ALBUM.—White Petrolatum. A colorless mixture of Hydrocarbons, chiefly of the Methane series.

SOURCE.—Obtained by distilling off the lighter and more volatile portions from Petroleum, and purifying the residue.

CHARACTERS.—A white unctuous mass, of about the consistence of an ointment, transparent in thin layers, completely amorphous, and without odor or taste. In other respects it has the characteristics of Petrolatum, and it is liable to the same impurities.

3. PETROLATUM LIQUIDUM.—Liquid Petrolatum. A mixture of Hydrocarbons, chiefly of the Methane series.

SOURCE.—Obtained by distilling off the lighter and more volatile portions from Petroleum, and purifying the residue.

CHARACTERS.—A colorless, or very slightly yellowish, oily, transparent liquid, without odor or taste, but giving off, when heated, a faint odor of Petroleum. Sp. gr., about 0.870 to 0.940. In other respects it has the same characteristics as Petrolatum, and it is liable to the same impurities.

ACTION.

Emollient.

USES.

As a bland, neutral protective, which does not become rancid. Since it is not affected by acids, alkalies or powerful reducing agents, it is employed as a substitute for fatty materials in ointments, but as it is absorbed with difficulty, it is not a suitable vehicle for drugs intended for absorption through the skin. Used with an atomizer, it may be employed as a local soothing application for mucous membranes and as a vehicle for medicinal substances.

III. BENZINUM.

PETROLEUM BENZIN. *Synonym.*—Petroleum Ether.

SOURCE.—A distillate from American Petroleum, consisting of hydrocarbons, chiefly of the marsh-gas series (C_5H_{12}, C_6H_{14}, and homologous compounds).

CHARACTERS.—A transparent, colorless, diffusive liquid, of a strong, characteristic odor, slightly resembling that of Petroleum, but much less disagreeable, and having a neutral reaction. It is highly inflammable, and its vapor, when mixed with air and ignited, explodes violently. Sp. gr., 0.638 to 0.660. It should be carefully kept in well-stoppered bottles or tin cans, in a cool place, remote from lights or fire. *Solubility.*—Insoluble in water; soluble in about 6 parts of Alcohol, and readily soluble in Ether, Chloroform, Benzene, volatile oils, and fixed oils, with the exception of Castor Oil.

IMPURITY.—Benzene.

Preparation.

Benzinum Purificatum.—Purified Petroleum Benzin. Potassium Permanganate, 10; Sodium Hydroxide, 2; Sulphuric Acid, 60; Petroleum Benzin, 1000; Water, a sufficient quantity. By repeated agitation, washing with water, and decantation.

IMPURITIES.—Heavy hydrocarbons, pyrogenous products, sulphur compounds.

ACTION.

Large doses cause gastro-enteritis, and benzin-poisoning may be induced by its inhalation.

USES.

Employed in pharmacy. It has occasionally been used externally for neuralgia and for scabies and prurigo and internally for tape-worm.

IV. PARAFFINUM.

PARAFFIN.—A mixture of Solid Hydrocarbons, chiefly of the Methane series.

SOURCE.—Usually obtained by chilling and pressing the distillates from Petroleum having high boiling points, and purifying the solid press cake so obtained.

CHARACTERS.—A colorless, more or less translucent mass, crystalline when separating from solution; without odor or taste, and slightly greasy to the touch. Sp. gr., from 0.890 to 0.905. *Solubility.*—Insoluble in water or Alcohol; slightly soluble in absolute Alcohol; readily soluble in Ether, Petroleum Benzin, Carbon Disulphide, volatile oils, and warm fixed oils.

IMPURITY.—Stearic acid.

ACTION.

Emollient.

USES.

In ointments, to coat pills, etc. Of late it has been employed, by injection, in the rectification of deformities, especially of the nose.

Various compounds containing Carbon will be found in Part II, Division I, "Synthetics and Allied Drugs."

GROUP VI.

Acids.

Those acids which will be considered here may be divided into two classes.

Class I.—Those which are strongly acid, the more powerfully acid being active caustics. They are **Sulphuric, Nitric, Hydrochloric, Nitro-hydrochloric, Phosphoric, Acetic, Tartaric, Citric** and **Lactic** acids. **Hydrobromic, Hydriodic** and **Hypophosphorous** acids might be placed here, but they have already been considered (*see* pp. 53, 56 and 69).

Class II.—Those which, although feebly acid, are powerfully antiseptic. They are **Sulphurous** and **Boric** acids.

Camphoric, Diluted Hydrocyanic, Benzoic, Gallic, Tannic Oleic, Stearic, Trichlor-acetic and Salicylic acids and Phenol (Carbolic Acid) are not used as acids, and will be considered under other headings.

What were formerly termed Arsenous Acid and Chromic Acid are not true acids; they are Anhydrides, and are considered elsewhere (*see* pp. 72 and 152).

CLASS I.

1. **ACIDUM SULPHURICUM.**—Sulphuric Acid. *Synonym.*—Oil of Vitriol. A liquid composed of not less than 92.5 per cent., by weight, of absolute Sulphuric Acid [(H_2SO_4 or $SO_2(OH)_2$ = 97.35], and about 7.5 per cent. of water. It should be kept in glass-stoppered bottles.

SOURCE.—Produced by the combustion of Sulphur or Iron Pyrites, and the oxidation and hydration of the resulting Sulphur Dioxide gas by means of nitrous and aqueous vapors. $2HNO_3 + 2SO_2 + H_2O = 2H_2SO_4 + N_2O_3$. $N_2O_3 + 2SO_2 + O_2 + H_2O = 2SO_2$, $OHNO_2$. $2SO_2$, $OHNO_2 + H_2O = 2H_2SO_4 + N_2O_3$.

CHARACTERS.—A colorless liquid of oily consistence, inodorous, and very caustic and corrosive. Sp. gr., not below 1.826. Miscible, in all proportions, with water or Alcohol.

IMPURITIES.—Nitric, nitrous, sulphurous and hydrochloric acids, lead, arsenic, selenium, heavy metals.

INCOMPATIBLES.—Alkalies, their carbonates, barium, calcium, lead and silver salts, hypophosphorous acid, vegetable astringent infusions.

Sulphuric Acid is used to make Ether *and in* Benzinum Purificatum, Glycyrrhizinum Ammoniatum, Liquor Ferri Subsulphatis, Liquor Ferri Tersulphatis, Oleum Æthereum, and Spiritus Ætheris Nitrosi.

Preparations.

1. **Acidum Sulphuricum Aromaticum.**—Aromatic Sulphuric Acid. *Synonym.*—Elixir of Vitriol. Sulphuric Acid, 111; Oil of Cinnamon, 1; Tincture of Ginger, 50; Alcohol, a sufficient quantity to make 1000. Sp. gr., about 0.933. It should contain 20 per cent., by weight, of absolute Sulphuric Acid, partly in the form of Ethyl-Sulphuric Acid.

Dose, 1 c.c. (15 ♏).

2. **Acidum Sulphuricum Dilutum.**—Diluted Sulphuric Acid. Sulphuric Acid, 100; distilled water, 825. Sp. gr., about 1.067. Contains 10 per cent., by weight, of absolute Sulphuric Acid.

Dose, 2. c.c. (30 ♏).

Diluted Sulphuric Acid is used to prepare Ferri Sulphas Granulatus and Syrupus Rosæ.

2. **ACIDUM NITRICUM.**—Nitric Acid. A liquid composed of 68 per cent., by weight, of absolute Nitric Acid (HNO_3 or $NO_2 \cdot OH = 62.57$), and 32 per cent. of water. It should be kept in glass-stoppered bottles.

SOURCE.—Made from Potassium Nitrate by distilling with Sulphuric Acid. $KNO_3 + H_2SO_4 = KHSO_4 + HNO_3$.

CHARACTERS.—A colorless, fuming liquid, very caustic and corrosive, and having a peculiar, somewhat suffocating odor. Sp. gr., about 1.403.

IMPURITIES.—Sulphuric, hydrochloric, iodic and bromic acids, iodine, bromine, arsenic, heavy metals, nitre, and lower nitrogen oxides, giving ruddy fumes.

INCOMPATIBLES.—Alcohol, alkalies, carbonates, oxides, ferrous sulphate, lead acetate.

Nitric Acid is contained in Liquor Ferri Nitratis, Liquor Zinci Chloridi, and Unguentum Hydrargyri Nitratis.

Preparations.

1. **Acidum Nitricum Dilutum.**—Diluted Nitric Acid Nitric Acid, 100; distilled water, 580. Sp. gr., about 1.054. It contains 10 per cent., by weight, of absolute Nitric Acid.

Dose, 2 c.c. (30 ♏).

2. **Acidum Nitrohydrochloricum.**—Nitrohydrochloric Acid. *Synonyms.*—Nitromuriatic Acid. Aqua regia. Nitric Acid, 180; Hydrochloric Acid, 820. A golden-yellow, fuming, and very corrosive liquid, having a strong odor of Chlorine.

Dose, 0.2 c.c. (3 ♏).

3. **Acidum Nitrohydrochloricum Dilutum.**—Diluted Nitrohydrochloric Acid. *Synonym.*—Diluted Nitromuriatic Acid. Nitric Acid, 40; Hydrochloric Acid, 182; distilled water, 778. Contains Free Chlorine, Hydrochloric, Nitric and Nitrous Acids, and other compounds dissolved in water. It should not be dispensed unless recently prepared.

Dose, 1 c.c. (15 ♏).

3. **ACIDUM HYDROCHLORICUM.**—Hydrochloric Acid. A liquid compound of 31.9 per cent., by weight, of Absolute Hydrochloric Acid (HCl = 36.18), and 68.1 per cent. of water. It should be kept in glass-stoppered bottles.

SOURCE.—The fumes produced by the action of Sulphuric Acid on Sodium Chloride are dissolved in water. $2NaCl + H_2SO_4 = HCl + NaCl + NaHSO_4$ and $NaCl + NaHSO_4 = HCl + Na_2SO_4$.

CHARACTER.—A colorless, fuming liquid, of a pungent odor, and an intensely acid taste. Sp. gr., about 1.158. Miscible, in all proportions, with water or Alcohol.

IMPURITIES.—Bromine, iodine, free chlorine, heavy metals, sulphates and sulphuric and sulphurous acids.

INCOMPATIBLES.—Lead and silver salts, alkalies and their carbonates, oxidizable substances (with which it forms explosive compounds), alcohols, ethers, carbohydrates, sulphur and sulphides, phosphorus, etc.

Hydrochloric Acid is contained in Liquor Ferri Chloridi and Liquor Zinci

Chloridi *and is used to prepare* Liquor Chlori Compositus, Resina Podophylli, and Talcum Purificatum.

Preparations.

1. **Acidum Hydrochloricum Dilutum.**—Diluted Hydrochloric Acid. *Synonym.*—Diluted Muriatic Acid. Hydrochloric Acid, 100; distilled water, 219. It should contain 10 per cent., by weight, of absolute Hydrochloric Acid. Sp. gr., about 1.049.

Dose, 1 c.c. (15 m).

Diluted Hydrochloric Acid is contained in Liquor Acidi Arsenosi *and is used to prepare* Extractum Ergotæ.

2. **Acidum Nitrohydrochloricum.**—*See* Nitric Acid.

3. **Acidum Nitrohydrochloricum Dilutum.**—*See* Nitric Acid.

4. **ACIDUM PHOSPHORICUM.**—Phosphoric Acid. A liquid composed of not less than 85 per cent., by weight, of absolute Orthophosphoric Acid [H_3PO_4 or $PO(OH)_3 = 97.29$], and 15 per cent. of water. It should be kept in glass-stoppered bottles.

SOURCE.—When Phosphorus is brought into contact with Nitric Acid, it is slowly oxidized and converted into Phosphoric Acid. $P_2 + 5HNO_3 + 2H_2O = 3H_3PO_4 + 5NO$.

CHARACTERS.—A colorless liquid of a syrupy consistence, without odor, and having a strong acid taste. Sp., gr. 1.707. Miscible, in all proportions, with water or Alcohol.

IMPURITIES.—Metaphosphoric, pyrophosphoric, phosphorous, sulphuric, nitric, and hydrochloric acids, phosphates, arsenic, heavy metals.

Phosphoric Acid is contained in Elixir Ferri, Quininæ et Strychninæ Phosphatum, Glyceritum Ferri, Quininæ et Strychninæ Phosphatum, Syrupus Calcii Lactophosphatis, and Syrupus Ferri, Quininæ et Strychninæ Phosphatum.

Preparation.

Acidum Phosphoricum Dilutum.—Diluted Phosphoric Acid. Phosphoric Acid, 100; distilled water, 750. Sp. gr., about 1.057. It should contain 10 per cent., by weight, of absolute Orthophosphoric Acid.

Dose, 2 c.c. (30 m).

5. **ACIDUM ACETICUM.**—Acetic Acid. A liquid composed of not less than 36 per cent., by weight, of absolute Acetic Acid ($CH_3 \cdot COOH$) = 59.58) and about 64 per cent. of water.

SOURCE.—By the oxidation of Ethyl Alcohol or by the destructive distillation of wood.

CHARACTERS.—A clear, colorless liquid, having a strong, vinegar-like odor,

a purely acid taste, and a strongly acid reaction. Sp. gr., about 1.045. Miscible, in all proportions, with water or Alcohol.

IMPURITIES.—Heavy metals, copper, sulphuric, formic, sulphurous and hydrochloric acids.

Acetic Acid is used to make the Aceta, *and in* Elixir Ferri, Quininæ et Strychninæ Phosphatum, Syrupus Ipecacuanhæ, Tinctura Sanguinariæ, and several of the Extracts and Fluidextracts.

Preparation.

Acidum Aceticum Dilutum.—Diluted Acetic Acid. Acetic Acid, 100; distilled water, 500. Sp. gr., about 1.009. It should contain not less than 6 per cent., by weight, of absolute Acetic Acid.

Dose, 2 c.c. (30 ♏).

6. ACIDUM ACETICUM GLACIALE.—Glacial Acetic Acid. A liquid containing not less than 99 per cent., by weight, of absolute Acetic Acid ($CH_3 \cdot COOH = 59.58$), and not more than 1 per cent. of water.

SOURCE.—Distil dry Sodium Acetate with strong Sulphuric Acid. $NaC_2H_3O_2 + H_2SO_4 = HC_2H_3O_2 + NaHSO_4$.

CHARACTERS.—A clear, colorless liquid, of a strong, vinegar-like odor, and a very pungent, acid taste. Sp. gr., not higher than 1.049. It has the same impurities as Acetic Acid.

7. ACIDUM TRICHLORACETICUM. *See* p. 178.

8. ACIDUM CITRICUM.—Citric Acid. $H_3C_6H_5O_7 + H_2O = 208.50$. A tribasic organic acid [$C_3H_4(OH)(COOH)_3 + H_2O$], usually prepared from the juice of limes or lemons. It should contain not less than 99.9 per cent. of pure Citric Acid.

SOURCE.—Found in the fruits of the Lime (*Citrus Bergamia*) and Lemon (*Citrus Limonum*). Chalk is added to the boiling juice, usually lemon juice, $2H_3C_6H_5O_7 + 3CaCO_3 = Ca_3(C_6H_5O_7)_2 + 3CO_2 + 3H_2O$. The precipitated Calcium Citrate is boiled with Sulphuric Acid. After filtration and evaporation, Citric Acid crystallizes out. $Ca_3(C_6H_5O_7)_2 + 3H_2SO_4 = 2H_3C_6H_5O_7 + 3CaSO_4$.

CHARACTERS.—Colorless, translucent, right-rhombic prisms, odorless, and having an agreeable, purely acid taste; efflorescent in warm air, and deliquescent when exposed to moist air. *Solubility.*—In 0.54 part of water; 1.55 parts of Alcohol; 18 parts of Ether. Citric Acid, like Tartaric Acid, is often used to produce an effervescing mixture with Ammonium, Sodium or Potassium Carbonates, the two solutions being mixed immediately before taking. Carbon Dioxide, which causes the effervescence, is formed thus: $3KHCO_3 + H_3C_6H_5O_7 = K_3C_6H_5O_7 + 3CO_2 + 3H_2O$.

IMPURITIES.—Sulphuric, tartaric and oxalic acids, iron, calcium, heavy metals.

INCOMPATIBLES.—Potassium tartrate, mineral acids, alkaline carbonates, sulphides, acetates.

Free Citric Acid is contained in Limonis Succus.

Citric Acid is used to make Bismuthi Citras, Caffeina Citrata, Caffeina Citrata Effervescens, Ferri et Quininæ Citras, Ferri et Quininæ Citras Solubilis, Ferri et Strychninæ Citras, Liquor Magnesii Citratis, Liquor Potassii Citratis, Liquor Sodii Phosphatis Compositus, Lithii Citras Effervescens, Magnesii Sulphas Effervescens, Potassii Citras Effervescens, Sodii Phosphas Effervescens, Syrupus Aurantii, and Syrupus Lactucarii.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparation.

Syrupus Acidi Citrici.—Syrup of Citric Acid. Citric Acid, 10; water, 10; Tincture of Fresh Lemon Peel, 10; Syrup to 1000.

Syrup of Citric Acid is contained in Liquor Magnesii Citratis.

9. ACIDUM TARTARICUM.—Tartaric Acid. $H_2C_4H_4O_6(COOH)_2 = 148.92$. A dibasic organic acid $[C_2H_2(OH)_2(COOH)_2]$, usually prepared from argol. It should contain not less than 99.5 per cent. of pure Tartaric Acid.

SOURCE.—Boil Acid Potassium Tartrate with Calcium Carbonate. $2KHC_4H_4O_6 + CaCO_3 = CaC_4H_4O_6 + K_2C_4H_2O_6 + H_2O + CO_2$. Calcium Chloride is now added, which precipitates more Calcium Tartrate. $K_2C_4H_4O_6 + CaCl_2 = CaC_4H_4O_6 + 2KCl$. The Calcium Tartrate is finally decomposed with Sulphuric Acid. $CaC_4H_4O_6 + H_2SO_4 = H_2C_4H_4O_6 + CaSO_4$. Then evaporate the fluid to the sp. gr. of 1.21. Separate the Calcium Sulphate crystals that form. Again evaporate, Tartaric Acid crystallizes out.

CHARACTERS.—Colorless, translucent, monoclinic prisms, or crystalline crusts, or a white powder, odorless, and having a purely acid taste. *Solubility.*—In 0.71 part of water and in 1.67 parts of Alcohol; in about 0.5 part of boiling water and about 0.2 part of boiling Alcohol; in 250 parts of Ether; nearly insoluble in Chloroform, Benzene or Petroleum Benzin.

IMPURITIES.—Oxalic and sulphuric acids, iron, calcium, heavy metals.

INCOMPATIBLES.—Potassium salts, calcium, mercury, lead, vegetable astringents.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Tartaric Acid is used to make Acidum Hydriodicum Dilutum, Caffeina Citrata Effervescens, Lithii Citras Effervescens, Magnesii Sulphas Effervescens, Potassii Citras Effervescens. Pulvis Effervescens Compositus, and Sodii Phosphas Effervescens.

10. ACIDUM LACTICUM.—Lactic Acid. A liquid organic acid, composed of not less than 75 per cent., by weight, of absolute Lactic Acid ($CH_3 \cdot CHOH \cdot COOH = 89.37$), and about 25 per cent. of water.

SOURCE.—Usually obtained by subjecting milk-sugar or grape-sugar to lactic fermentation.

CHARACTERS.—A colorless syrupy liquid, odorless, of a purely acid taste, and absorbing moisture on exposure to damp air. Sp. gr., about 1.206. Freely miscible with water, Alcohol or Ether.

IMPURITIES.—Chlorides, sulphates, sarcolactic acid, butyric and other fatty acids, glycerin, sugar, heavy metals, organic impurities.

Dose, 2 c. c. (30 ♏).

Lactic Acid is used in Syrupus Calcii Lactophosphatis.

ACTION.

Irritant, corrosive, astringent, hæmostatic, refrigerant. The nature of the escharotic action of the more powerful acids varies to some extent with the constituents of the tissues with which they come in contact, but, on the whole, consists in withdrawal of water, the formation of acid albumins, softening of the connective tissue and epithelium, and, in special situations, solution of calcareous material. They all coagulate albumin, and solutions not sufficiently strong to form a slough act as astringents and hæmostatics. Weak solutions are refrigerant. Nitric acid forms a yellow stain and eschar, and sulphuric, brown or black. In the mouth, œsophagus and stomach the strong acids cause complete destruction of the mucous membrane, and death, with symptoms of shock and collapse, may immediately result from perforation. In other cases cicatrices result which may eventually lead to a fatal termination. Diluted acids cause some increase in the flow of bile, and nitrohydrochloric acid is a decided cholagogue and hepatic stimulant. When the gastric juice is deficient in acid they assist digestion if taken after eating. As a rule, they quickly become converted into neutral salts.

USES.

Nitric acid is the preferred escharotic for venereal sores, warts, poisoned wounds, phagedæna and cancrum oris, and glacial acetic acid is successfully used for warts, corns, ulcers, lupus, etc. Hydrochloric acid is also employed to some extent as a caustic. Lactic acid has been advocated as a solvent for false membranes in diphtheria and croup, and is frequently used as a topical ap-

plication in tuberculosis of the larynx. Any well-diluted acid may be applied to check slight hæmorrhages, and sulphuric acid is made use of locally in the night-sweats of phthisis. When acids are used internally it is advisable that they should be taken through a glass tube to prevent injury of the teeth. Lemon juice or citric acid itself is given in fevers, and diluted sulphuric acid is frequently used as a prophylactic and remedy for lead poisoning. Both nitric and sulphuric acids are useful in diarrhœal conditions. Hydrochloric acid especially is given to rectify deficiency in acidity in the gastric juice, and it is also employed in typhoid fever. Nitrohydrochloric acid is of service in hepatic disorders and in oxaluria. Citric, tartaric and acetic acids, being converted into alkaline carbonates in the system, may be given to increase the alkalinity of the blood and to alkalize the urine or render it less acid.

Toxicology.—If strong sulphuric or nitric acid has been swallowed, the stomach-tube should not be employed, on account of the danger of causing perforation. The best antidote is the insoluble magnesia or magnesium carbonate, but almost any alkali may be employed. Demulcents; anodynes; stimulants.

CLASS II.

1. **ACIDUM SULPHUROSUM.**—Sulphurous Acid. An aqueous solution containing not less than 6 per cent., by weight, of Sulphur Dioxide ($SO_2 = 63.59$), and about 94 per cent. of water.

SOURCE.—Sulphuric Acid, 60; is heated with Charcoal, 20; and the resulting Sulphur Dioxide is dissolved in water. $4H_2SO_4 + C_2 = 4SO_2 + 2CO_2 + 4H_2O$.

CHARACTERS.—A colorless liquid, having the characteristic odor of burning Sulphur, and an acid, sulphurous taste. Sp. gr., not less than 1.028.

IMPURITY.—Sulphuric acid.

Dose, 2 c.c. (30 ♏).

ACTION.

Disinfectant, deodorant, parasiticidal. It has a strong affinity for oxygen, becomes oxidized to sulphuric acid, and is highly poisonous to parasitic organisms. It also arrests the action of ferments. The official solution is strongly irritant to raw surfaces and mucous membranes. In the stomach it has an anti-

septic effect and also interferes with the action of the digestive ferments. It is excreted by the kidneys and alimentary canal in the form of sulphates. The gas, in concentrated form, is entirely irrespirable, causing spasm of the glottis.

Uses.

Sulphur dioxide, generated from burning sulphur, is used for disinfecting holds of ships, apartments, etc., but is not so efficient as formaldehyde, which has the further advantage of not injuring fabrics. Scabies may be very rapidly cured by exposing the patient, his head excepted, to the fumes of the gas. The diluted solution is sometimes employed as a spray or gargle in scarlet fever, diphtheria and septic sore-throat and as a spray in chronic bronchitis with fetid expectoration. It is locally applied in tinea and other parasitic affections, and to foul ulcers and sloughing or gangrenous wounds. It may be given internally in cases of dilated stomach, with fermentation, and of indigestion with pyrosis, but its liability to arrest the normal digestive ferments must not be forgotten.

2. ACIDUM BORICUM.—Boric Acid. $H_3BO_3 = 61.54$. It should contain not less than 99.8 per cent. of pure Boric Acid [$B(OH)_3$].

Source.—Native from Northern Tuscany, or made by the action of Hydrochloric Acid on Borax by filtration and recrystallization. $Na_2B_4O_7 + 2HCl + 10H_2O = 4H_3BO_3 + 2NaCl + 5H_2O$.

Characters.—Transparent, colorless scales, of a somewhat pearly lustre, or six-sided, triclinic crystals, or a light, white, very fine powder, slightly unctuous to the touch, odorless, and having a faintly bitterish taste. *Solubility.*—In 18 parts of water; 4.6 of Glycerin; 15.3 of Alcohol; 3 parts of boiling water and 4.3 parts of boiling Alcohol.

Impurities.—Chlorides, sulphates, iron, magnesium, calcium, arsenic, heavy metals.

Incompatibles.—Alkaline hydroxides, carbonates and earths.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Boric Acid is contained in Cataplasma Kaolini.

Preparations.

1. Glyceritum Boroglycerini.—Glycerite of Boroglycerin. *Synonyms.*—Glycerite of Glyceryl Borate. Solution of Boroglyceride. Boric Acid, 310; Glycerin to 1000.

2. Liquor Antisepticus.—Antiseptic Solution. Boric Acid, 20; Benzoic Acid, 1; Thymol, 1; Eucalyptol, 0.25; Oil of Peppermint, 0.50; Oil of Gaultheria, 0.25; Oil of Thyme, 0.10; Alcohol, 250; Purified Talc, 20; Water to 1000.

Dose, 4 c.c. (1 fl. dr.).

3. Unguentum Acidi Borici.—Ointment of Boric Acid. Boric Acid, 100; Paraffin, 100; White Petrolatum, 800.

3. SODII BORAS.—Sodium Borate. $Na_2B_4O_7 + 10H_2O = 379.32$. *Synonyms.*—Borax. Sodium Pyroborate. It should contain in the uneffloresced condition not less than 99 per cent. of pure Sodium Tetraborate, and should be kept in well-stoppered bottles.

SOURCE.—Native, as a saline incrustation on the shores of certain lakes and as a crystalline deposit at the bottom of the Borax lake of California, or by boiling together Boric Acid and Sodium Carbonate and crystallization. $4H_3BO_3 + Na_2CO_3 = Na_2B_4O_7 + CO_2 + 6H_2O$.

CHARACTERS.—Colorless, transparent, monoclinic prisms, or a white powder, inodorous, and having a sweetish alkaline taste. *Solubility.*—In 20.4 parts of water and 0.5 part of boiling water; in 1 of Glycerin at 80° C. (176° F.); insoluble in Alcohol.

IMPURITIES.—Sodium carbonate, bicarbonate, nitrate and phosphate.

INCOMPATIBLES.—Mineral acids, metallic and alkaloidal salts.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Sodium Borate is contained in Unguentum Aquæ Rosæ.

ACTION.

Irritant; antiseptic. Moderate doses may have an aperient effect, while large doses cause vomiting and purging, with much prostration. If death does not occur, scaly eruptions appear upon the skin, and such eruptions are liable to result from prolonged use of the drug in considerable amount.

USES.

While boric acid and borax are of service as mild antiseptics, they are practically valueless as disinfectants. The saturated solution of the acid is much used as an antiseptic application. Irrigations with it should not be continued too long, however, as toxic symptoms have been known to be produced in this way. The glycerite of boroglycerin, diluted, is also an excellent antiseptic wash. Internally, boric acid is given chiefly for correcting the fetor of fermentative dyspepsia and in cases of cystitis with decomposing urine.

DIVISION II: THE METALS.

GROUP I.

The Alkali Metals: Potassium, Sodium, Lithium, Ammonium.

I. POTASSIUM.

K = 38.86.

1. POTASSII HYDROXIDUM.—Potassium Hydroxide. KOH = 55.74. *Synonym.*—Caustic Potash. It should contain not less than 85 per cent. of pure anhydrous Potassium Hydroxide, and not more than 2 per cent. of other inorganic substances, except water. It should be kept in well-stoppered bottles made of hard glass.

SOURCE.—Evaporate Liquor Potassæ, fuse the residue and pour into clean cylindrical moulds which have been previously warmed.

CHARACTERS.—Dry, white, or nearly white, flakes, fused masses, or in pencils, hard and brittle, showing a crystalline fracture; odorless, or having a faint odor of lye, and of a very acrid and caustic taste. *Great caution is necessary in tasting and handling it*, as it rapidly destroys organic tissues. Exposed to the air, it rapidly absorbs Carbon Dioxide and moisture, and deliquesces. *Solubility.*—In about 0.4 part of water and in 2 parts of Alcohol; very soluble in boiling water and in boiling Alcohol; slightly soluble in Ether.

IMPURITIES.—Potassium carbonate, heavy metals.

Preparation.

1. Liquor Potassii Hydroxidi.—Solution of Potassium Hydroxide. An aqueous solution, containing about 5 per cent. of Potassium Hydroxide.

SOURCE.—Dissolve Potassium Hydroxide, 60, in distilled water, 940. The hydroxide should be of the full strength and quality directed by the U. S. P. (85 per cent.), but Potassium Hydroxide of any other strength may be used, if a proportionately larger or smaller quantity be taken. Solution of Potassium Hydroxide should be kept in bottles made of green glass, and provided with glass stoppers coated with paraffin or petrolatum.

CHARACTERS.—A clear colorless liquid, odorless, and having a very acrid and caustic taste and a strong alkaline reaction. Sp. gr. about 1.046.

INCOMPATIBLES.—Acids, acid salts, metallic salts and preparations of ammonia, belladonna, hyoscyamus and stramonium, the alkaloids of these three being decomposed by caustic potash. All alkaloids are precipitated by alkalies.

Dose, 1 c.c. (15 ♏).

Solution of Potassium Hydroxide is used to make Fluidextractum Senegæ.

Unofficial Preparation.

Potassa cum Calce.—Potassa with Lime. *Synonym.*—Vienna Caustic. Vienna Paste. Potassa, 500; Lime, 500. Rubbed together in a warm, iron mortar.

CHARACTERS.—A grayish-white powder, deliquescent, having a strongly alkaline reaction, and responding to the tests for Calcium and Potassium. *Solubility.*—In diluted hydrochloric acid without leaving more than a small residue.

ACTION.

Powerfully irritant and caustic; general action of alkalies. Caustic potash is one of the strongest escharotics known, combining with the water of the part to which it is applied; also with the tissue elements to form alkaline albuminates and with the fats to form soaps. In this way it dissolves the skin and causes necrosis of the deeper tissues. It penetrates more deeply than most other corrosives. Very dilute solutions appear to have a sedative effect; strong solutions destroy all tissues with which they come in contact. The accidental swallowing of caustic alkalies is a frequent cause of cicatricial strictures of the œsophagus. Concentrated solutions, however, usually cause death in a short time, and if the dose is large this may be immediate from cardiac paralysis, due to the reflex influence on the central nervous system. By medicinal doses the urinary and bronchial secretions are increased. Excretion takes place chiefly by the kidneys.

USES.

As a caustic, its effects are somewhat difficult to limit, but, on account of the thorough and penetrating character of its escharotic action, it is to be preferred when a very deep and decided influence is desired. Potassa cum Calce is milder and more manageable than pure potassa. After the withdrawal of the caustic, diluted vinegar may be applied to neutralize any alkali that may remain. Liquor Potassii Hydroxidi is sometimes employed to dissolve the oily secretions and thoroughly clean the skin, and to remove the epidermis, in certain forms of chronic

cutaneous disease. In like manner, it softens callosities, such as corns and bunions, and in sufficiently weak solution it is of service in allaying itching. Potash is not much used internally, as it is liable to cause gastric irritation.

Toxicology.—Emetics (it is not safe to use the stomach-pump, as the tube is liable to perforate the corroded wall of the œsophagus or stomach); dilute acids (vinegar is almost always promptly obtainable); demulcents; measures to counteract shock and collapse.

2. POTASSI CARBONAS.—Potassium Carbonate. $K_2CO_3 = 137.27$. *Synonym.*—Salt of Tartar. It should contain, when thoroughly dried, not less than 98 per cent. of pure Potassium Carbonate [$CO.(OK)_2$], and should be kept in well-stoppered bottles.

SOURCE.—Pearlash, which is a product of the lixiviation of wood ashes, is treated with water, which dissolves little but potassium carbonate, and the solution is evaporated.

CHARACTERS.—A white, granular powder, odorless, and having a very strong alkaline taste; very deliquescent. *Solubility.*—In 0.91 part of water and about 0.65 part of boiling water; insoluble in Alcohol.

IMPURITIES.—Nitrates, earthy matters, heavy metals.

INCOMPATIBLES.—Acids; acid, alkaloidal, and most metallic salts; urethane. The same incompatibles apply to other carbonates.

Dose, 1 gm. (15 gr.).

Potassium Carbonate is used in preparing Mistura Ferri Composita, Pilulæ Ferri Carbonatis (in which Ferrous Carbonate is formed), Spiritus Ætheris Nitrosi, Syrupus Rhei, and Syrupus Rhei Aromaticus.

3. POTASSII BICARBONAS.—Potassium Bicarbonate. $KHCO_3 = 99.41$. It should contain not less than 99 per cent. of pure Potassium Bicarbonate [$CO(OH)(OK)$], and should be kept in well-stoppered bottles.

SOURCE.—Pass Carbon Dioxide through a solution of Potassium Carbonate, and let the bicarbonate crystallize out. $K_2CO_3 + CO_2 + H_2O = 2KHCO_3$.

CHARACTERS.—Colorless, transparent, monoclinic prisms, or a colorless, odorless, granular powder, having a saline and slightly alkaline taste. Permanent in the air. *Solubility.*—In about 3 parts of water at 25° C. (77° F.), and 1.9 parts at 50° C. (122° F.). At a higher temperature the solution rapidly loses Carbon Dioxide, and, after being boiled, contains only Potassium Carbonate. Almost insoluble in Alcohol.

IMPURITIES.—The carbonate; heavy metals.

Dose, 2 gm. (30 gr.).

Potassium Bicarbonate is used in preparing Liquor Magnesii Citratis,

Liquor Potassii Arsenitis, Liquor Potassii Citratis, Magnesii Sulphas Effervescens, and Potassii Citras Effervescens.

ACTION.

The same as that of potassium hydroxide, except much less corrosive.

USES.

In weak solution or as a paste the carbonate may be used for allaying itching; it is also employed in baths to soften the epidermis and cause stimulation of large areas in skin diseases like ichthyosis. For internal use the bicarbonate is decidedly preferable. This is occasionally used to relieve acidity in dyspepsia: when it should be given well diluted and in small doses. It is thought preferable to other alkalies where there is indigestion of fats, and in affections of the liver where the flow of bile into the intestine is interfered with it is also useful in promoting the digestion and absorption of fats. It should not be employed as an antidote to mineral acids, on account of the resulting evolution of carbon dioxide gas. It has been extensively used in gout and rheumatism. As it is very distasteful to most persons, it may be given in effervescence with lemon-juice or with citric acid solution. It is useful in jaundice and gall-stone disease, and, combined with other expectorants, in bronchitis.

4. POTASSII ACETAS.—Potassium Acetate. $KC_2H_3O_2 = 97.44$. It should contain, when thoroughly dried, not less than 98 per cent. of pure Potassium Acetate, and should be kept in well-stoppered bottles.

SOURCE.—Add Acetic Acid in excess to Potassium Carbonate or Bicarbonate. Evaporate to dryness and fuse the residue. $K_2CO_3 + 2HC_2H_3O_2 = 2KC_2H_3O_2 + H_2O + CO_2$. Or, if the bicarbonate, which is preferable, is used, $KHCO_3 + HC_2H_3O_2 = KC_2H_3O_2 + H_2O + CO_2$.

CHARACTERS.—A white powder, or crystalline masses of a satin-like lustre, odorless, and having a warming, saline taste; very deliquescent. *Solubility.*—In 0.4 part of water, and 2 parts of Alcohol; much more soluble in both liquids at high temperatures.

IMPURITIES.—Arsenic, heavy metals.

INCOMPATIBLES.—Mineral acids. These are incompatible with other acetates also.

Dose, 2 gm. (30 gr.).

5. POTASSII CITRAS. — Potassium Citrate. $K_3C_6H_5O_7 + H_2O = 323.08$. It should contain not less than 99 per cent. of pure Potassium Citrate [$C_3H_4(OH)(COOK)_3 + H_2O$], and should be kept in well-stoppered bottles.

SOURCE.—Neutralize Potassium Carbonate with a solution of Citric Acid, and evaporate to dryness. $3K_2CO_3 + 2H_3C_6H_5O_7 = 2K_3C_6H_5O_7 + 3H_2O + 3CO_2$.

CHARACTERS.—Transparent, prismatic crystals, or a white, granular powder, odorless, and having a cooling, saline taste. Deliquescent on exposure to the air. *Solubility.*—In about 0.5 part of water; very soluble in boiling water; sparingly in Alcohol.

IMPURITIES.—The tartrate and heavy metals.

INCOMPATIBLES.—Alcohol, lead acetate, potassium permanganate in acid solution, silver nitrate. The same incompatibles apply to other citrates.

Dose, 1 gm. (15 gr.).

Preparation.

Liquor Potassii Citratis.—Solution of Potassium Citrate. *Synonym.*—Mistura Potassii Citratis. Citric Acid, 6; Potassium Bicarbonate, 8; water to 100. The acid and the bicarbonate are dissolved separately and the solutions mixed. It should contain not less than 8 per cent. of anhydrous Potassium Citrate [$C_3H_4(OH)(COOK)_3 = 304.2$], with small amounts of Citric and Carbonic Acids.

Dose, 16 c.c. (4 fl. dr.).

6. POTASSII CITRAS EFFERVESCENS.—Effervescent Potassium Citrate. Potassium Citrate, 200; Sodium Bicarbonate, 477; Tartaric Acid, 252; Citric Acid, 162.

SOURCE.—The Citric Acid and Tartaric Acid, dried and powdered, are mixed with the Potassium Citrate, after it has been dried and powdered; and the Sodium Bicarbonate is then thoroughly incorporated. The mixture is subjected to a high temperature in an oven, and when, by the aid of careful manipulation with a wooden spatula, it has acquired a moist consistence, it is rubbed through a sieve and the granules are dried at a temperature not exceeding 54° C. (129.2° F.).

CHARACTERS.—A fine, white powder, odorless, and having a pleasant, saline taste. *Solubility.*—Completely in water, with effervescence.

Dose, 4 gm. (60 gr.).

ACTION.

These are the least irritating to the stomach of all the potassium salts. Being decomposed in the body, with the formation of carbonates, they exert an alkaline action after absorption, and

this has the effect of increasing the alkalinity of the blood and urine and of causing free diuresis. They are also diaphoretics.

Uses.

They are largely used in gouty conditions and were formerly much used also in the alkaline treatment of acute rheumatism. The citrate, dissolved in an excess of lemon juice, is quite palatable. These salts are given for their diuretic effect in feverishness, scarlatinal dropsy, chronic renal disease, and general dropsy from valvular disease of the heart; but they are of little value for relieving dropsical accumulations in the various cavities. In irritation of the urinary organs resulting from an excess of acid and in inflammatory conditions of the passages they are of great service. They are also useful in the prevention of uric acid gravel by reducing the acidity of the urine, and, like potassium bicarbonate, they assist the action of other expectorants in bronchitis.

7. POTASSII SULPHAS.—Potassium Sulphate. $K_2SO_4 = 173.07$. It should contain not less than 99 per cent. of pure Potassium Sulphate [$SO_2(OK)_2$].

Source.—Add Potassium Carbonate to Acid Potassium Sulphate, which is a by-product of the manufacture of Nitric Acid. $K_2CO_3 + 2KHSO_4 = 2K_2SO_4 + CO_2 + H_2O$.

Characters.—Hard, colorless, transparent, six-sided, rhombic prisms terminated by pyramids, or a white powder, odorless, and having a somewhat bitter, saline taste. *Solubility.*—In about 9 parts of water and in 4 parts of boiling water; insoluble in Alcohol.

Impurities.—Arsenic, heavy metals.

Dose, 2 gm. (30 gr.).

8. POTASSII BITARTRAS.—Potassium Bitartrate. $KHC_4H_4O_6 = 187.78$. *Synonym.*—Cream of Tartar. It should contain not less than 99 per cent. of pure Potassium Bitartrate [$C_2H_2(OH)_2(COOH)(COOK)$], and should be kept in well-stoppered bottles.

Source.—Obtained from crude Tartar (argol) deposited on the sides of wine casks during the fermentation of grape juice, and purified by boiling water, filtration through charcoal and crystallization.

Characters.—Colorless or slightly opaque rhombic crystals, or a white, somewhat gritty, powder, odorless, and having a pleasant, acidulous taste. *Solubility.*—In about 200 parts of water and in 16.7 parts of boiling water; very sparingly in Alcohol.

IMPURITIES.—Alum, heavy metals, starch, kaolin, calcium phosphate, and other insoluble matter.

Dose (diuretic), **2 gm. (30 gr.).**

Potassium Bitartrate is contained in Pulvis Jalapæ Compositus.

ACTION.

They are hydragogue saline cathartics. In large doses, and when insufficiently diluted, the sulphate is a powerful irritant, and has been known to cause fatal gastro-enteritis. A portion of the bitartrate is converted into carbonate, which has a decided diuretic effect and also tends to render the urine alkaline.

USES.

Potassium sulphate is rarely prescribed in this country. The bitartrate in moderate doses is frequently employed as a cooling aperient, but should not be given too long continuously, as it is liable to impair digestion. In larger doses it is a valuable hydragogue cathartic, particularly in dropsy and uræmia, and it is often combined with jalap and other purgatives. It is highly esteemed as a diuretic.

9. POTASSII NITRAS.—Potassium Nitrate. $KNO_3 = 100.43$. *Synonyms.*—Nitre. Saltpetre. It should contain not less than 99 per cent. of pure Potassium Nitrate ($NO_2 \cdot OK$), and should be kept in well-stoppered bottles.

SOURCE.—Purified native Saltpetre.

CHARACTERS.—Colorless, transparent, six-sided, rhombic prisms, or a white crystalline powder; odorless, and having a cooling, saline and pungent taste. *Solubility.*—In 3.6 parts of water and in 0.4 part of boiling water; very sparingly in Alcohol.

IMPURITIES.—Potassium iodide, chlorate and perchlorate; heavy metals.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Potassium Nitrate is used to prepare Argenti Nitras Mitigatus.

ACTION.

In small doses it is unirritating. In large quantities it is a pronounced gastro-intestinal irritant, but if it is very freely diluted this action may in great measure be prevented. It is a cardiac depressant and tends to exert a paralyzing influence upon the spinal cord and upon unstriped muscular fibre. It is

a mild diaphoretic and a more active diuretic, and large doses may cause renal inflammation and hæmaturia. Large doses also retard the respiration.

Uses.

It is not now often given internally. By reason of its influence on respiration and on unstriped muscular fibre it is decidedly useful in relieving the symptoms of asthma; for which purpose the fumes of the burning potassium nitrate paper are inhaled. Powdered nitre, moistened with water and applied to the face, may be employed to remove freckles.

10. **POTASSII CHLORAS.**—Potassium Chlorate. $KClO_3 = 121.68$. It should contain not less than 99 per cent, of pure Potassium Chlorate ($ClO_2 \cdot OK$), and should be kept in well-stoppered bottles. ***Great caution should be observed in handling it,*** as dangerous explosions are liable to occur when it is heated or subjected to concussion or trituration with organic substances (Cork, Tannic Acid, Sugar, etc.), or with Sulphur, Antimony Sulphide, Phosphorus, or other easily oxidizable substances.

Source.—Pass Chlorine into a mixture of Potassium Carbonate and Slaked Lime; then treat the result in boiling water and separate the Chlorate by re-crystallization. $K_2CO_3 + 6Ca(OH)_2 + 6Cl_2 = 2KClO_3 + 5CaCl_2 + CaCO_3 + 6H_2O$. At present the electrolytic method of making the chlorate is more generally employed.

Characters.—Colorless, lustrous, monoclinic prisms or plates, or a white granular powder, odorless and having a cooling, characteristic taste. *Solubility.*—In 16 parts of water and in 1.7 parts of boiling water; insoluble in Absolute Alcohol, but slightly soluble in Diluted Alcohol.

Impurities.—Heavy metals, nitrates, nitrites.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Potassium Chlorate is used to make Liquor Chlori Compositus.

Preparation.

Trochisci Potassii Chloratis.—Troches of Potassium Chlorate. Potassium Chlorate, 15; Sugar, 60; Tragacanth, 3.; water, a sufficient quantity to make 100 troches. Mix the Sugar with the Tragacanth by trituration in a mortar; then transfer the mixture to a sheet of paper, and, by means of a bone spatula, mix with it the Potassium Chlorate, being careful, by avoiding trituration or pressure, to prevent the mixture from igniting or exploding. Lastly, with water, form a mass. Each troche contains .15 gm. (2½ gr.).

Action.

Irritant, producing gastro-enteritis. Toxic doses may cause marked failure of the heart's action, dyspnœa and cyanosis; also headache, delirium, spasms, coma and a peculiar stiffness of the extremities. These effects are probably due to the blood-changes caused by the drug and to the uræmia resulting from its action on the kidneys. Methæmoglobin is formed from the conversion of hæmoglobin, a destructive influence is exerted on the red blood corpuscles, and death may result from asphyxia. The renal tubules eventually become stopped up with the products of the destruction of the blood cells, resulting in almost total suppression of urine, but the absorption of concentrated solutions is often shortly followed by considerable diuresis. Actual nephritis may or may not be present. Potassium chlorate does not yield its oxygen to the system, as formerly supposed, but passes unchanged through the body; being excreted mainly in the urine and in small quantities in the various other secretions. Locally it is disinfectant and stimulant to mucous membranes.

Uses.

Locally applied it is of great service in various diseased conditions of the mucous membrane, especially of the mouth and fauces. Its internal use is now regarded as of but little value, and may cause toxic symptoms. In diphtheria, however, it may prove useful in combination with tincture of ferric chloride and hydrochloric acid, though it should not be given in full doses. Such a mixture, diluted, makes an excellent gargle.

Toxicology.—Prompt evacuation of the stomach; demulcents; alkaline carbonates. The patient should be treated symptomatically.

11. **POTASSII BROMIDUM,** *see* Bromine.

12. **POTASSII ET SODII TARTRAS,** *see* Sodium.

13. **POTASSII IODIDUM,** *see* Iodine.

14. **POTASSII PERMANGANAS,** *see* Manganese.

15. **POTASSII FERROCYANIDUM.** — Potassium Ferrocyanide. $K_4Fe(CN)_6 + 3H_2O = 419.62$. *Synonym.*—Yellow Potassium Prussiate.

It should contain not less than 99 per cent. of pure Potassium Ferrocyanide, and should be kept in well-stoppered bottles.

SOURCE.—Produced by the action of Potassium Cyanide upon Iron compounds, or upon free Iron (in which case the oxygen of the air or water participates). Prepared commercially by igniting carbonized nitrogenous animal matter with potashes and Iron. The Carbon and Nitrogen of the organic matter combine with the Potassium of the potashes to form Potassium Cyanide, and Iron Sulphide is formed from the combination with the Iron of the Sulphur, which is present. In consequence of treating with water, the Potassium Cyanide and Iron Sulphide react upon each other, and there results Potassium Cyanide, which is purified by crystallization. $FeS + 6KCN = K_4Fe(CN)_6 + K_2S$.

CHARACTERS.—Large, soft, transparent, yellow, four-sided, monoclinic, tabular crystals or prisms; odorless, and having a mild, saline taste. Slightly efflorescent on exposure to air. *Solubility.*—In about 4 parts of water, and in 2 parts of boiling water; insoluble in Alcohol.

IMPURITIES.—Potassium carbonate and ferricyanide.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Potassium Ferrocyanide is used to prepare Potassii Cyanidum; also as a test for iron, copper and zinc.

16. **POTASSII CYANIDUM.**—Potassium Cyanide. KCN = 64.70. It should contain not less than 95 per cent. of pure Potassium Cyanide, and should be kept in well-stoppered bottles.

SOURCE.—Heat in an iron crucible dried Potassium Ferrocyanide, 8; with Potassium Carbonate, 3; until effervescence ceases.

CHARACTERS.—White, opaque, amorphous pieces, or a white, granular powder, odorless when perfectly dry; deliquescent in the air and exhaling the odor of Hydrocyanic Acid. *Great caution should be used in tasting and handling this salt. Solubility.*—In about 2 parts of water and sparingly in alcohol. Boiling water dissolves its own weight of the salt, but rapidly decomposes it.

IMPURITIES.—Potassium carbonate, ferrocyanide and sulphocyanate.

INCOMPATIBLES.—Acids, alkalies, hydrated chloral, iodine, lead, mercurous and silver salts, permanganates, potassium chlorate and nitrate.

Dose, 0.010 gm. = 10 milligm. (⅙ gr.).

Preparation.

Acidum Hydrocyanicum Dilutum.—Diluted Hydrocyanic Acid. *Synonym.*—Diluted Prussic Acid. A liquid compound of not less than 2 per cent., by weight, of absolute Hydrocyanic Acid (HCN = 26.84), and 98 per cent. of water. It should be kept in small, dark amber-colored, cork-stoppered vials in a cool place.

SOURCE.—It may be prepared, extemporaneously, in the following manner: Mix Hydrochloric Acid, 15.54, with distilled water, 44.10; add Silver Cyanide, 6, and shake the whole together in a glass-stoppered bottle. When the precipitate has subsided, pour off the clear liquid. Scheele's Prussic Acid is a 4 or 5 per cent. solution.

CHARACTERS.—A colorless liquid, of a characteristic odor, resembling that of bitter almonds. *It should be tasted with great caution.* It is very unstable; old specimens may be inert.

IMPURITIES.—Sulphuric and hydrochloric acids.

INCOMPATIBLES.—Mineral acids, silver, copper and iron salts, red mercuric oxide, sulphides.

Dose, 1 c.c. (15 ♏).

Hydrocyanic Acid is found in several vegetable drugs, but on account of its chemical relationship it is considered in this place.

ACTION.

Hydrocyanic acid is an active protoplasmic poison, toxic to all forms of life. There is at first stimulation and then depression and paralysis of the central nervous system, especially of the medullary centres, and death results from arrest of the respiratory function. A considerable rise is followed by a marked fall of blood-pressure, and the cardiac muscle is directly affected by the depressing action of the drug. The tissues are unable to absorb the oxygen brought to them by the blood cells; consequently, the oxyhæmoglobin is not reduced in the capillaries, and the venous blood has the same bright red color as the arterial. The diluted acid has a sedative and anæsthetic effect. It is rapidly decomposed in the body.

USES.

Locally the acid is valuable as an antiseptic. Internally it is used to relieve vomiting and gastric and intestinal pain, as well as to ally cerebral excitement and irritating cough. The uses of potassium cyanide are similar.

Toxicology.—With large doses death rapidly ensues. Under smaller quantities there are nausea and vomiting, headache, dyspnœa, slow pulse, dilated pupils, and great prostration, soon followed by unconsciousness, with or without convulsions, and then general paralysis. *Postmortem.*—

The characteristic odor of hydrocyanic acid is usually perceptible. The body is livid and the blood very dark, in consequence of the rapid death. Postmortem rigidity sets in very early. *Treatment.*—Prompt evacuation of the stomach, artificial respiration; cold or alternate hot and cold affusions; cardiac and general stimulants; cobalt nitrate as a chemical antagonist.

17. **POTASSII DICHROMAS,** *see* Chromium.

18. **POTASSII HYPOPHOSPHIS,** *see* Phosphorus.

19. **SAPO MOLLIS** (Oleate of Potassium), *see* Acidum Oleicum.

II. SODIUM.

Na = 22.88.

1. **SODII HYDROXIDUM.**—Sodium Hydroxide. NaOH = 39.76. *Synonym.*—Caustic Soda. It should contain not less than 90 per cent. of pure anhydrous Sodium Hydroxide, and not more than 2 per cent. of other inorganic substances, except water. It should be kept in well-stoppered bottles made of hard glass.

SOURCE.—Dissolve Sodium Carbonate in boiling distilled water. Slake Lime and dissolve in distilled water, adding this in small portions at a time to the solution of Sodium Carbonate, boil, strain when cold, set aside until clear and remove the clear solution. Evaporate this solution to an oily consistence and pour into moulds. $Na_2CO_3 + Ca(OH)_2 = 2NaOH + CaCo_3$.

CHARACTERS.—Dry, white or nearly white flakes, powder, fused masses, or translucent or opaque white pencils; odorless, and having a caustic taste. *It should be tasted and handled with great caution. Solubility.*—In about 1 part of water and in 0.8 part of boiling water; very soluble in Alcohol.

IMPURITIES.—Potassium, sodium carbonate and silicate, heavy metals, organic matter, insoluble impurities.

Preparation.

Liquor Sodii Hydroxidi.—Solution of Sodium Hydroxide. An aqueous solution, containing about 5 per cent. of Sodium Hydroxide.

SOURCE.—Dissolve Sodium Hydroxide, 56, in distilled water, 944. The Sodium Hydroxide must be of the full strength directed by the U. S. P. (90 per cent.). Sodium Hydroxide of any other strength, however, may be used, if a proportionately larger or smaller quantity be taken. Solution of Sodium Hydroxide should be kept in bottles made of green glass, and provided with glass stoppers coated with paraffin or petrolatum.

CHARACTERS.—A clear, colorless liquid, odorless, and having a very acrid, caustic taste and a strong alkaline reaction. Sp. gr., about 1.056.

IMPURITIES.—As of Sodium Hydroxide.

INCOMPATIBLES.—The same as of Potassium Hydroxide.

Dose, 1 c.c. (15 ♏).

Solution of Sodium Hydroxide is used to make Fluidextractum Taraxaci.

ACTION.

Practically the same as that of potassium hydroxide. The principal difference between the effects of sodium and potassium salts is the depressant influence of the latter, but it is to be noted that sodium hydroxide and sodium carbonates, like the potassium hydroxide and carbonates, depend chiefly for their activity on their alkalinity, and not on their metallic constituent.

USES.

But little employed, potassium hydroxide being almost always preferred.

Toxicology.—(*See* Potassii Hydroxidum).

2. SODII CARBONAS MONOHYDRATUS.—Monohydrated Sodium Carbonate, $Na_2CO_3 + H_2O = 123.19$. It should contain not less than 85 per cent. of pure anhydrous Sodium Carbonate [$CO \cdot (ONa)_2$], corresponding to not less than 99.5 per cent. of the crystallized monohydrated salt.

SOURCE.—Prepared by crystallizing ordinary Sodium Carbonate (which contains 10 molecules of water of crystallization) above 35° C. (95° F.).

CHARACTERS.—A white, crystalline, granular powder, odorless, and having a strongly alkaline taste. When exposed to air, under ordinary conditions, it absorbs only a slight percentage of moisture; exposed to warm, dry air at or above 50° C. (122° F.) the salt effloresces, and at 100° C. (212° F.) it loses its water of crystallization (14.52 per cent.). *Solubility.*—In 2.9 parts of water and in 1.8 parts of boiling water; in 1.02 parts of Glycerin; insoluble in Alcohol and in Ether.

IMPURITIES.—Heavy metals.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Monohydrated Sodium Carbonate is used to prepare Alumini Hydroxidum Extractum Ergotæ, Liquor Sodæ Chlorinatæ, Massa Ferri Carbonatis, Spiritus Ætheris Nitrosi, and Suppositoria Glycerini.

Unofficial Preparation.

Sodii Carbonas Exsiccatus.—Dried Sodium Carbonate.

SOURCE.—200 parts of Sodium Carbonate are broken into small fragments, allowed to effloresce, then gently heated until it becomes a white powder, weighing 100 parts.

CHARACTERS.—A loose, white powder, odorless, and having a strongly alkaline taste.

Dose, .30 to 1.00 gm. (5 to 15 gr.).

ACTION.

Except that the carbonate is much less corrosive than the hydroxide, its action is the same as that of the latter. Sodium carbonate is, however, decidedly more irritating than the bicarbonate.

USES.

Externally for skin diseases of a dry character, especially in the form of baths; also to prevent rusting of surgical instruments in the process of sterilization by boiling. Seldom employed internally except as it occurs in natural mineral waters, but as an antidote to acids in corrosive poisoning it is preferable to the bicarbonate.

3. **SODII BICARBONAS.**—Sodium Bicarbonate. $NaHCO_3 = 83.43$. *Synonyms.*—Baking Soda. Soda. It should contain not less than 99 per cent. of pure Sodium Bicarbonate [CO(OH)(ONa)], and should be kept in well-closed vessels, in a cool place.

SOURCE.—Made from the Carbonate in the same way as the Potassium Bicarbonate is made. $Na_2CO_3 + CO_2 + H_2O = 2NaHCO_3$. Or by treating Sodium Chloride at the same time with Ammonia gas and Carbon Dioxide. $NaCl + NH_3 + CO_2 + H_2O = NaHCO_3 + NH_4Cl$.

CHARACTERS.—A white opaque powder, odorless, and having a cooling, mildly alkaline taste. In moist air it is slowly decomposed.

Solubility.—In 12 parts of water at 15° C. (59° F.); above this temperature the solution gradually loses Carbon Dioxide, and at boiling heat the salt is entirely converted into normal carbonate; insoluble in Alcohol.

IMPURITIES.—The carbonate and sulphocyanate; heavy metals.

INCOMPATIBLES.—It is decomposed by acids and acid salts, *e.g.*, bismuth subnitrate.

Dose, 1 gm. (15 gr.).

Sodium Bicarbonate is used to prepare Caffeina Citrata Effervescens, Ferri Carbonas Saccharatus, Lithii Citras Effervescens, Magnesii Sulphas

Effervescens, Mistura Rhei et Sodæ, Potassii Citras Effervescens, Pulvis Acetanilidi Compositus, Pulvis Effervescens Compositus, and Sodii Phosphas Effervescens.

Preparation.

Trochisci Sodii Bicarbonatis.—Troches of Sodium Bicarbonate. Sodium Bicarbonate, 18; Sugar, 54; Myristica, 1; Mucilage of Tragacanth, a sufficient quantity to make 100 troches. Triturate the Nutmeg with the Sugar, gradually added, until they are reduced to a fine powder, and mix this intimately with the Sodium Bicarbonate; then with the Mucilage of Tragacanth, form a mass. Each troche contains .18 gm. (3 gr.) of Sodium Bicarbonate.

ACTION.

The same as that of potassium bicarbonate, except that it is absorbed more slowly from the alimentary canal; much more grateful to the stomach than either sodium or potassium carbonate.

USES.

In solution or powder in burns, acute tonsillitis, and poisoning by Rhus toxicodendron; also to relieve itching. Internally, much employed in dyspeptic conditions, especially hyperacidity of the stomach, and in the acid diarrhœa of infants. The effervescence resulting from the successive employment of sodium bicarbonate and tartaric acid has been made use of in the stomach to excite emesis in cases of narcotic stupor and in the intestine to overcome intussusception. Good results have been reported from large doses of sodium bicarbonate and carbonate in diabetic coma.

4. **SODII PHOSPHAS.**—Sodium Phosphate. $Na_2HPO_4 + 12H_2O = 355.61$. *Synonym.*—Sodium Orthophosphate. It should contain, in an uneffloresced condition, not less than 99 per cent. of pure Di-sodium-orthophosphate [$PO \cdot (OH)(ONa)_2 + 12H_2O$], and should be kept in well-stoppered bottles, in a cool place.

SOURCE.—Digest Bone Ash with Sulphuric Acid; Acid Calcium Phosphate is formed. $Ca_3(PO_4)_2 + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$. Filter and add Sodium Carbonate to the solution. $CaH_4(PO_4)_2 + Na_2CO_3 = Na_2HPO_4 + H_2O + CO_2 + CaHPO_4$. The filtrate requires to be evaporated and the salt is obtained by crystallization.

CHARACTERS.—Large, colorless, monoclinic prisms, or a granular, crystalline salt; odorless, and having a cooling, saline taste. The crystals effloresce on exposure to the air, and gradually lose 5 molecules of their water of crystallization (25.1 per cent.). *Solubility.*—In about 5.5 parts of water; insoluble in Alcohol.

IMPURITIES.—Calcium, arsenic, sodium carbonate, heavy metals.

Dose, 2 gm. (30 gr.).

Sodium Phosphate is used to prepare Ferri Phosphas Solubilis and Sodii Pyrophosphas.

Preparations.

1. **Sodii Phosphas Effervescens.**—Effervescent Sodium Phosphate. Powder Citric Acid, 162, and mix it intimately with Exsiccated Sodium Phosphate, 200, and Tartaric Acid, 252; then thoroughly incorporate Sodium Bicarbonate, 477. Place the mixed powders in an oven heated to between 93° and 104° C. (199.4° and 219.2° F.); when the mixture has acquired a moist consistence, by the aid of careful manipulation with a wooden spatula, rub it through a sieve, and dry the granules at a temperature not exceeding 54° C. (129.2° F.).

Dose, 8 gm. (120 gr.).

2. **Sodii Phosphas Exsiccatus.**—Exsiccated Sodium Phosphate. A white powder which absorbs moisture readily. Allow crystals of Sodium Phosphate to effloresce for several days in warm air; continue the drying in an oven; raise the temperature very gradually until 100° C. (212° F.) has been reached, and maintain this temperature until the salt ceases to lose weight; powder and sift the residue.

Dose, 1 gm. (15 gr.).

3. **Liquor Sodii Phosphatis Compositus.**—Compound Solution of Sodium Phosphate. Sodium Phosphate, 1000; Sodium Nitrate, 40; Citric Acid, 130; Distilled Water to make 1000. By trituration, solution and filtration.

Dose, 8 c.c. (2 fl. dr.).

5. **SODII SULPHAS.**—Sodium Sulphate. $Na_2SO_4 + 10H_2O = 319.91$. *Synonym.*—Glauber's Salt. It should contain, in an uneffloresced condition, not less than 99 per cent. of pure Sodium Sulphate $[SO_2(ONa)_2 + 10H_2O]$, and should be kept in well-closed vessels, in a cool place.

SOURCE.—Neutralize with Sodium Carbonate, the residue left in the manufacture of Hydrochloric Acid from Salt. $2NaHSO_4 + Na_2CO_3 = 2Na_2SO_4 + CO_2 + H_2O$.

CHARACTERS.—Large, colorless, transparent, monoclinic prisms; odorless,

and having a bitter, saline taste; efflorescing rapidly on exposure to air, and finally losing all of their water of crystallization. *Solubility.*—In 2.8 parts of water at 15° C. (59° F.), and in 0.25 part at 34° C. (93.2° F.); insoluble in Alcohol; soluble in Glycerin.

IMPURITIES.—Arsenic, heavy metals.

Dose, 16 gm. (240 gr.).

6. POTASSII ET SODII TARTRAS.—Potassium and Sodium Tartrate. $KNaC_4H_4O_6 + 4H_2O = 280.18$. *Synonyms.*—Rochelle Salt. Tartarated Soda. It should contain not less than 99 per cent. of pure Potassium and Sodium Tartrate [$C_2H_2(OH)_2(COOK)(COONa) + 4H_2O$], and should be kept in well-stoppered bottles.

SOURCE.—Add Acid Potassium Tartrate to a hot solution of Sodium Carbonate. $2KHC_4H_4O_6 + Na_2CO_3 = 2KNaC_4H_4O_6 + H_2O + CO_2$.

CHARACTERS.—Colorless, transparent, rhombic prisms, or a white powder, odorless, and having a cooling saline taste. The crystals are slightly efflorescent. *Solubility.*—In about 1.2 parts of water and in less than 1 part of boiling water; insoluble in Alcohol.

IMPURITIES.—Ammonia, heavy metals.

INCOMPATIBLES.—Acids, ammonium chloride, barium, calcium and lead salts, magnesium, potassium sulphate, sodium sulphate, silver nitrate.

Dose, 8 gm. (120 gr.).

Preparation.

Pulvis Effervescens Compositus.—Compound Effervescing Powder. *Synonym.*—Seidlitz Powder. Take Potassium and Sodium Tartrate, 93 gm., and Sodium Bicarbonate, 31 gm.; mix, divide into twelve equal parts, and wrap each part in a separate blue paper. Tartaric Acid, 27 gm., divide into twelve equal parts, and wrap each part in a separate white paper. Each powder in blue paper contains 7.75 gm., about 120 gr., of Potassium and Sodium Tartrate with 2.58 gm., 40 gr., of Sodium Bicarbonate. The white paper contains 35 gr., 2.25 gm., of Tartaric Acid.

Dose.—1 set of two powders.

ACTION.

These are typical saline purgatives, owing their effects not to irritation, but to retarded absorption and their acid constituent. The sulphate is the most powerful and is an important element in the composition of many well-known natural mineral waters. Its intravenous injection is said to produce free diuresis. Both the sulphate and phosphate are mild cholagogues.

USES.

On account of its nauseous taste, the sulphate is rarely given in this country, except as it occurs in natural aperient waters. Although much less efficient, Rochelle salt is in quite general use as a mild saline cathartic. In small repeated doses it does not purge, and serves to render the urine alkaline. The sulphate and phosphate are often of service in the treatment of gall-stones, probably chiefly by improving the condition of the mucous membrane, and the phosphate is held in repute in various affections of the liver. It is also employed in nervous diseases.

SODII CITRAS.

7. SODIUM CITRATE.—$2Na_3C_6H_5O_7 + 11H_2O = 709.20$. It should contain not less than 97 per cent. of pure Sodium Citrate $[C_3H_4(OH)(COONa)_3 + 11H_2O]$.

SOURCE.—Saturate a solution of Citric Acid with Sodium Bicarbonate, evaporate, and allow it to crystallize. $2H_3C_6H_5O_7 + 6NaHCO_3 = 2Na_3C_6H_5O_7 + 6H_2O + 6CO_2$.

CHARACTERS.—A white, granular powder, odorless, and having a cooling, saline taste. It slowly effloresces on exposure to dry air. *Solubility.*—In 1.1 parts of water and 0.4 part of boiling water; slightly soluble in Alcohol.

IMPURITIES.—The carbonate, chloride and sulphate; heavy metals.

Dose, 1 gm. (15 gr.).

Sodium Citrate is contained in Syrupus Hypophosphitum Compositus.

ACTION.

Purgative; its properties are similar to those of magnesium citrate. In small doses it is diuretic.

USES.

It is a pleasant laxative.

8. SODII CHLORIDUM.—Sodium Chloride. $NaCl = 58.06$. *Synonym.*—Common Salt. It should contain when dried not less than 99 per cent. of pure Sodium Chloride.

SOURCE.—Occurs native.

CHARACTERS.—Colorless, transparent, cubical crystals, or a white, crystalline powder, odorless, and having a purely saline taste. *Solubility.*—In 2.8 parts of water and 2.5 parts of boiling water; almost insoluble in Alcohol.

IMPURITIES.—Heavy metals, sodium bromide and iodide.

Dose (emetic), 16 gm. (240 gr.).

Action.

The effects of sodium chloride are limited to the alteration in the fluids produced by its excess or deficiency, and they present a typical example of what is known as salt-action. As its molecular weight is small and as it dissociates readily into its two ions, it possesses great osmotic power. In the mouth and fauces strong solutions have an astringent action, while in the stomach and intestine respectively they may have an emetic and purgative effect. The flow of urine is increased to some extent by the absorption of salt solution from the alimentary canal, and very markedly by the injection of such a solution into the circulation. The ingestion of an adequate amount of sodium chloride is essential to the maintenance of health.

Uses.

Locally it is of service in affections of the mucous membranes, and salt baths are invigorating as well as cleansing. A strong solution constitutes one of the best injections for thread-worms, and salt solutions are also used to limit the action of silver nitrate. Hot salt, enclosed in bags, is a good application in lumbago and various other painful conditions. Internally, as an emetic and also in dyspeptic conditions, administered in carbon dioxide water or in the form of natural mineral waters. Solutions of salt in distilled water are given by intravenous injection or hypodermatoclysis in conditions where the body has lost much fluid, and also in carbon dioxide or coal gas poisoning and in uræmia and similar intoxications. In poisoning by silver nitrate sodium chloride arrests the corrosive action.

9. SODII SULPHIS.—Sodium Sulphite. $Na_2SO_3 + 7H_2O = 250.39$. It should contain, in the uneffloresced and air-dried condition, not less than 94 per cent. of pure Sodium Sulphite, and should be kept in well-stoppered bottles, in a cool place.

Source.—Saturate a solution of Sodium Carbonate or Caustic Soda with Sulphur Dioxide gas. $Na_2CO_3 + SO_2 = Na_2SO_3 + CO_2$.

Characters.—Colorless, transparent, monoclinic prisms; odorless, and having a cooling, saline, sulphurous taste; efflorescent in air; becomes slowly

oxidized to sulphate. *Solubility.*—In 2 parts of water and 1.4 of boiling water; sparingly in Alcohol.

IMPURITIES.—Sodium thiosulphate, heavy metals.

Dose, 1 gm. (15 gr.).

10. SODII BISULPHIS.—Sodium Bisulphite. $NaHSO_3 = 103.35$. It should contain not less than 90 per cent. of pure Sodium Bisulphite, and should be kept in a cool place, in small, completely filled, well-stoppered bottles.

SOURCE.—From Sodium Carbonate or Bicarbonate and Sulphur Dioxide gas. $NaHCO_3 + SO_2 = NaHSO_3 + CO_2$.

CHARACTERS.—Opaque, prismatic crystals, or a granular powder, exhaling an odor of Sulphur Dioxide, and having a disagreeable, sulphurous taste. *Solubility.*—In 3.5 parts of water and 70 of Alcohol; in about 2 parts of boiling water and 49 of boiling Alcohol.

IMPURITIES.—Sodium thiosulphate, heavy metals.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

11. SODII THIOSULPHAS.—Sodium Thiosulphate. $Na_2S_2O_3 + 5H_2O = 246.46$. It should contain not less than 98 per cent. of pure Sodium Thiosulphate, and should be kept in well-stoppered bottles.

SOURCE.—From Sodium Bisulphate in solution with Metallic Zinc. $3NaHSO_3 + Zn = NaHSO_3 + Na_2S_2O_3 + ZnO_2 + H_2O$. Or pass Sulphurous Anhydride into a solution of Soda (or Sodium Carbonate) with Sulphur. $SO_2 + 2Na(OH) + S = Na_2S_2O_3 + H_2O$.

CHARACTERS.—Colorless, transparent, monoclinic prisms, odorless and having a cooling, afterwards bitter taste. *Solubility.*—In about 0.35 part of water; at a boiling heat the solution is rapidly decomposed; insoluble in Alcohol; slightly soluble in Oil of Turpentine.

IMPURITIES.—The sulphide, sulphite and bisulphite, calcium, arsenic, heavy metals, caustic alkali and carbonate.

Dose, 1 gm. (15 gr.).

ACTION.

Tend to arrest putrefaction and other forms of fermentation.

USES.

Aphthous sore mouth; gastric fermentation, especially yeasty vomiting; by inhalation in gangrene of the lung, fetid bronchitis, etc. Locally the thiosulphate is useful in rhus poisoning and in pruritus from other causes, and internally is recommended in malarial hæmaturia.

12. SODII ARSENAS, *see* Arsenic.

13. **SODII BROMIDUM,** *see* Bromine.

14. **SODII HYPOPHOSPHIS,** *see* Phosphorus.

15. **SODII IODIDUM,** *see* Iodine.

16. **SODII PHENOLSULPHONAS,** *see* Phenol.

17. **SODII NITRAS.**—Sodium Nitrate. $NaNO_3 = 84.45$. It should contain not less than 99 per cent. of pure Sodium Nitrate ($NO_2 \cdot ONa$), and should be kept in well-stoppered bottles.

SOURCE.—Imported from Chili and Peru.

CHARACTERS.—Colorless, transparent, rhombohedral crystals, odorless, and having a cooling, saline and slightly bitter taste. Hygroscopic in moist air. *Solubility.*—In about 1.1 parts of water and about 100 parts of Alcohol; in 0.6 part of boiling water and 40 parts of boiling Alcohol.

IMPURITIES.—Sodium iodide, heavy metals.

Dose, 1 gm. (15 gr.).

Sodium Nitrate is used for preparing Sodium Arsenate *and is contained in* Liquor Sodii Phosphatis Compositus.

ACTION.

Similar to that of potassium nitrate, but much less depressant to the heart.

USES.

Rarely employed; has been given in diarrhœa and dysentery and in maniacal excitement and epilepsy.

18. **SODII ACETAS.**—Sodium Acetate. $NaC_2H_3O_2 + 3H_2O = 135.10$. It should contain, in an uneffloresced condition, not less than 99.5 per cent. of pure Sodium Acetate ($CH_3 \cdot COONa + 3H_2O$), and should be kept in well-stoppered bottles.

SOURCE.—From Sodium Carbonate and Acetic Acid. $Na_2CO_3 + 2HC_2H_3O_2 = 2NaC_2H_3O_2 + H_2O + CO_2$. By evaporation to crystallization.

CHARACTERS.—Colorless, transparent, monoclinic prisms, or a granular, crystalline powder, odorless, and having a cooling, saline taste. Efflorescent in warm, dry air. *Solubility.*—In about 1 part of water and in 23 parts of Alcohol; in all proportions of boiling water and of boiling Alcohol.

IMPURITIES.—Potassium, arsenic, heavy metals.

Dose, 1 gm. (15 gr.).

Sodium Acetate is used for preparing Acetic Ether.

ACTION.

The same as potassium acetate.

Uses.

Rheumatism; gout; dropsies; irritation of the genito-urinary tract.

19. **SODII BENZOAS,** *see* Acidum Benzoicum.

20. **SODII BORAS,** *see* Acidum Boricum.

21. **SODII NITRIS,** *see* Nitrites.

22. **SODII SALICYLAS,** *see* Acidum Salicylicum.

23. **SODII CHLORAS.**—Sodium Chlorate. $NaClO_3 = 105.70$. It should contain not less than 99 per cent. of pure Sodium Chlorate ($ClO_2 \cdot ONa$), and should be kept in well-stoppered bottles. On account of the danger of explosions, the same precautions should be observed in handling this salt as in the case of Potassium Chlorate.

Source.—From Acid Sodium Tartrate and Potassium Chlorate in solution; by filtration, evaporation and crystallization. $NaHC_4H_4O_6 + KClO_3 = NaClO_3 + KHC_4H_4O_6$.

Characters.—Colorless, transparent crystals (principally cubes with tetrahedral facets), or a crystalline powder; odorless, and having a cooling, saline taste. *Solubility.*—In about 1 part of water and about 100 parts of Alcohol; in 0.5 part of boiling water and about 40 parts of boiling Alcohol; in about 5 parts of Glycerin.

Impurities.—Potassium, heavy metals.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Action.

Similar to that of potassium chlorate.

Uses.

Occasionally employed as a substitute for potassium chlorate; recommended in gastric cancer.

24. **SODII PYROPHOSPHAS.**—Sodium Pyrophosphate. $Na_4P_2O_7 + 10H_2O = 443.02$. It should contain, in an uneffloresced condition, not less than 99 per cent. of pure Sodium Pyrophosphate $[(PO)_2O \cdot (ONa)_4 + 10H_2O]$, and should be kept in well-stoppered bottles.

Source.—From heating Sodium Phosphate. $2Na_2HPO_4 + 12H_2O = Na_4P_2O_7 + 13H_2O$.

Characters.—Colorless, transparent, monoclinic prisms, or a crystalline powder; odorless, and having a cooling, saline and feebly alkaline taste; slightly efflorescent in warm air. *Solubility.*—In about 11.5 parts of water and in 1.1 parts of boiling water; insoluble in Alcohol.

IMPURITIES.—The orthophosphate and carbonate, arsenic, heavy metals. **Dose, 2 gm. (30 gr.).**

Sodium Pyrophosphate is used to prepare Ferri Pyrophosphas Solubilis.

ACTION.

The same as that of sodium phosphate.

USES.

Principally in pharmacy.

25. SAPO (Oleate of Sodium), *see* Acidum Oleicum.

Unofficial Preparation.

Sodii Æthylas.—Sodium Ethylate. $NaC_2H_5O = 67.90$.

SOURCE.—By solution of Metallic Sodium in Ethylic Alcohol and crystallization. $2Na + 2C_2H_5OH = 2NaC_2H_5O + H_2$.

CHARACTERS.—A deliquescent, caustic salt in white or whitish crystals.

ACTION.

Powerfully corrosive; less painful than nitric acid.

USES.

By some considered the best of all caustics; has been employed especially for the destruction of nævi.

III. LITHIUM.

Li = 6.98.

1. LITHII CARBONAS.—Lithium Carbonate. $Li_2CO_3 = 73.51$. It should contain not less than 98 per cent. of pure Lithium Carbonate [$CO \cdot (OLi)_2$], and should be kept in well-stoppered bottles.

SOURCE.—By action of Lithium Chloride upon Ammonium Carbonate, filtration, washing with Alcohol, and drying. $2LiCl + NH_3HCO_3 = Li_2CO_3 + NH_4Cl + HCl$.

CHARACTERS.—A light, white powder, odorless, and having an alkaline taste. *Solubility.*—In 75 parts of water and 140 parts of boiling water; much more soluble in water saturated with Carbon Dioxide; insoluble in Alcohol; soluble, with active effervescence, in diluted acids.

IMPURITIES.—Iron, aluminum, heavy metals, other alkalies.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

2. LITHII CITRAS.—Lithium Citrate. $Li_3C_6H_5O_7 + 4H_2O = 280.08$. It should, when carefully dried, contain not less than 98.5 per cent. of pure

Lithium Citrate [C_3H_4 (OH) $(COOLi)_3$], and should be kept in well-stoppered bottles.

SOURCE.—By action of Lithium Carbonate upon Citric Acid, evaporation and crystallization. $3Li_2CO_3 + 2H_3C_6H_5O_7 = 2Li_3C_6H_5O_7 + 3H_2O + 3CO_2$.

CHARACTERS.—A white powder, or colorless crystals, odorless, and having a cooling, faintly alkaline taste; deliquescent on exposure to moist air. *Solubility.*—In about 2 parts of water and 1.5 parts of boiling water; almost insoluble in Alcohol or Ether.

IMPURITIES.—Iron, aluminum, alkalies, heavy metals.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparation.

Lithii Citras Effervescens.—Effervescent Lithium Citrate.

SOURCE.—Lithium Citrate, 50; Sodium Bicarbonate, 570; Tartaric Acid, 300; Citric Acid, a sufficient quantity, to 1000. Powder the Citric Acid and mix it with the Lithium Citrate, then incorporate the Sodium Bicarbonate. Place the mixed powders in an oven heated between 93° and 104° C. (199.4° and 219.2° F.). When the mixture, by the aid of careful manipulation with a wooden spatula, has acquired a moist consistence, rub it through a sieve and dry the granules at a temperature not exceeding 54° C. (129.2° F.).

Dose, 8 gm. (120 gr.).

ACTION.

These salts in medicinal doses rarely give rise to any definite symptoms in man, unless it be an increased flow of urine, but larger quantities may cause gastric derangement and possibly some muscular twitching. Injected into mammalian animals, they produce prostration, gastric disturbance, diuresis, dyspnœa, fall of temperature, and death (often preceded by convulsions) from arrest of the respiration. They render the urine very strongly alkaline.

USES.

Rheumatism and gouty affections, especially of a subacute and chronic character. Lithium salts enjoy a high reputation in the treatment of the so-called uric acid diathesis, but it is now the opinion of many of the best authorities that the benefit derived from their use is in great measure attributable to the large amount of water generally taken with them.

3. **LITHII BENZOAS,** *see* Acidum Benzoicum.

4. **LITHII BROMIDUM,** *see* Bromine.

5. **LITHII SALICYLAS,** *see* Acidum Salicylicum.

IV. AMMONIUM.

$NH_4 = 17.93$.

1. **AQUA AMMONIÆ FORTIOR.**—Stronger Ammonia Water. 28 per cent., by weight, of gaseous Ammonia ($NH_3 = 16.93$) dissolved in water. This solution deteriorates on keeping, and should be tested frequently; it should be kept in partially filled, strong, glass-stoppered bottles, and should be handled very cautiously.

SOURCE.—Generate Ammonia gas by heating Ammonium Chloride with Slaked Lime, and pass it into water. $2NH_4Cl + Ca(OH)_2 = NH_3 + 2H_2O + CaCl_2$.

CHARACTERS.—A colorless, transparent liquid, having an excessively pungent odor, a very caustic and alkaline taste, and a strongly alkaline reaction. Sp. gr., 0.897.

IMPURITIES.—Sulphates, chlorides, carbonic acid, heavy metals, readily oxidizable substances, coal-tar bases, fixed impurities.

Preparation.

Spiritus Ammoniæ.—Spirit of Ammonia. Contains 10 per cent., by weight, of the gas dissolved in Alcohol. Sp. gr., about 0.808.

Dose, 1 c.c. (15 ♏).

2. **AQUA AMMONIÆ.**—Ammonia Water. *Synonym.*—Ammonia. 10 per cent., by weight, of gaseous Ammonia dissolved in water.

SOURCE.—The same as for Aqua Ammoniæ Fortior.

CHARACTERS.—Like, but less pungent than the stronger solution. Sp. gr. 0.958.

INCOMPATIBLES.—Potassium and sodium hydroxides and carbonates, acids and solutions of acidulous salts, lime water, lead and silver salts. These are also incompatible with other Ammonium preparations.

Dose, 1 c.c. (15 ♏).

Ammonia Water is used to make Bismuth and Ammonium Citrate and Ferric Hydroxide.

Preparation.

1. **Linimentum Ammoniæ.**—Ammonia Liniment. *Synonym.*—Volatile Liniment. Ammonia Water, 350; Alcohol, 50; Cotton Seed Oil, 570; Oleic Acid, 30.

2. **Spiritus Ammoniæ Aromaticus,** *see* Ammonium Carbonate.

Action.

Concentrated solutions are rubefacient and vesicant, and their vapor is intensely irritating to mucous membranes. Taken internally, they are corrosive. Dilute solutions act as a mild gastric stimulant. Ammonia increases the secretions, especially the saliva, mucus and sweat, and has the property of dissolving fibrin. Upon the circulation it has a powerful, but evanescent, stimulating effect; taken by the mouth, it probably stimulates the heart through reflex action from the stomach. When the drug is inhaled or is injected into the circulation, it has the effect of stimulating the respiratory centre in the medulla oblongata. The spinal cord, as well as the medulla, is stimulated, and if the amount injected is sufficiently large, the stimulation is followed by paralysis of the central nervous system, with death by asphyxia. Excretion takes place by the salivary glands and lungs, as well as by the urine, in which ammonia is found in the form of urea.

Uses.

Externally as a rubefacient, and occasionally as a vesicant; also as an application to insect bites. By inhalation, in syncope and asphyxia. By intravenous injection in sudden paralysis of the heart from chloroform and other poisons, and in rapid thrombosis of large venous trunks. Internally, as a stimulant antacid.

3. AMMONII CARBONAS.—Ammonium Carbonate. $C_2H_{11}N_3O_5 = 156.01$. *Synonym.*—Bakers' Ammonia. It should contain not less than 97 per cent. of a mixture of Acid Ammonium Carbonate [$CO(OH)ONH_4$] and Ammonium Carbamate [$CO(NH_2)ONH_4$], and should yield not less than 31.58 per cent. of Ammonia gas. It should be kept in well-stoppered bottles, in a cool place, and for dispensing purposes only the translucent portions should be used.

Source.—A mixture of Ammonium Sulphate or Chloride and Calcium Carbonate is subjected to sublimation and resublimation. $4NH_4Cl + 2CaCO_3 = 2CaCl_2 + NH_4HCO_3 \cdot NH_4NH_2CO_2 + NH_3 + 2H_2O$.

Characters.—White, hard, translucent, striated masses, having a strongly ammoniacal odor, without empyreuma, and a sharp saline taste. On exposure to the air it loses both Ammonia and Carbon Dioxide, becoming opaque, and is finally converted into friable, porous lumps, or a white powder.

Solubility.—Slowly but completely in 4 parts of water. It is decomposed

by hot water. Alcohol dissolves the Carbamate, and leaves the acid Carbonate.

IMPURITIES.—Ammonium chloride, sulphate and thiosulphate, empyreumatic and non-volatile matters.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Ammonium Carbonate is used in Elixir Ferri, Quininæ et Strychninæ Phosphatum.

Preparation.

Spiritus Ammoniæ Aromaticus.—Aromatic Spirit of Ammonia. Ammonium Carbonate, 34; Ammonia Water, 90; Oil of Lemon, 10; Oil of Lavender Flowers, 1; Oil of Myristica, 1; Alcohol, 700; Distilled water to make 1000. Sp. gr. about 0.900.

Dose, 2 c.c. (30 ♏).

Aromatic Spirit of Ammonia is used in making Tinctura Guaiaci Ammoniata and Tinctura Valerianæ Ammoniata.

ACTION.

Similar to that of solutions of ammonia, though it is not so corrosive. It has important expectorant properties; increasing the bronchial mucus and rendering it more fluid, and also reflexly stimulating the respiratory centre in the medulla.

USES.

As a gastric, cardiac and general stimulant. It is often of service in alcoholism, and it is a valuable expectorant, especially for children and the aged.

4. AMMONII CHLORIDUM.—Ammonium Chloride. $NH_4Cl = 53.11$. *Synonym.*—Sal Ammoniac. It should contain not less than 99.5 per cent. of pure Ammonium Chloride.

SOURCE.—Neutralize Gas Liquor with Sulphuric Acid, converting all to Ammonium Sulphate. $2NH_4HO + H_2SO_4 = (NH_4)_2SO_4 + 2H_2O$. After crystallization, sublime with Sodium Chloride. $(NH_4)_2SO_4 + 2NaCl = 2NH_4Cl + Na_2SO_4$.

CHARACTERS.—A white, crystalline powder, without odor, having a cooling, saline taste, and permanent in the air, but volatile when heated. *Solubility.*—In 3 parts of water, 80 of Alcohol, 5 of Glycerin and in 1 part of boiling water.

IMPURITIES.—The sulphate and sulphocyanate, iron, calcium, barium, heavy metals, empyreumatic and non-volatile matters.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparation.

Trochisci Ammonii Chloridi.—Troches of Ammonium Chloride. Ammonium Chloride, 10; Extract of Glycyrrhiza, 20; Tragacanth, 2; Sugar, 40 gm.; Syrup of Tolu, a sufficient quantity to make 100 troches. Each troche contains .12 gm. (2 gr.).

ACTION.

It has the general action of ammonia, and is also an hepatic stimulant.

USES.

Externally, for local inflammations and for diseases of the mucous membrane, especially when chronic. Internally, for affections of the respiratory apparatus, disorders of the liver and bile-ducts, neuralgias, muscular rheumatism, and alcoholism. The disagreeable taste may be covered to a considerable extent by licorice or by the fluidextract of taraxacum.

5. **LIQUOR AMMONII ACETATIS.**—Solution of Ammonium Acetate. *Synonym.*—Spirit of Mindererus. An aqueous solution which should contain not less than 7 per cent. of Ammonium Acetate (CH_3COONH_4 = 76.51), with small amounts of Acetic and Carbonic Acids.

SOURCE.—Ammonium Carbonate, 5 gm., is gradually added to diluted Acetic Acid, 100 c.c., and the mixture is stirred until the carbonate is dissolved.

INCOMPATIBLES.—Potassium and sodium hydroxides and carbonates, acids, lime water, lead and silver salts.

Dose, 16 c.c. (4 fl. dr.).

Solution of Ammonium Acetate is used in preparing Liquor Ferri et Ammonii Acetatis.

ACTION.

Diuretic; diaphoretic.

USES.

Fevers; alcoholism; sick headache; scarlatinous dropsy; chronic Bright's disease.

6. **AMMONII BENZOAS,** *see* Acidum Benzoicum.

7. **AMMONII BROMIDUM,** *see* Bromine.

8. **AMMONII IODIDUM,** *see* Iodine.

9. **AMMONII SALICYLAS,** *see* Salicylic Acid.

10. **AMMONII VALERAS,** *see* Valeriana.

GROUP II.

1. The Alkaline Earths: Calcium, Strontium, Barium.

I. CALCIUM.

Ca = 39.8.

1. CRETA PRÆPARATA.—Prepared Chalk. $CaCO_3 = 99.35$. *Synonym.*—Drop Chalk.

SOURCE.—From Chalk (native Calcium Carbonate) by levigation, elutriation and drying.

CHARACTERS.—A white to grayish-white, very fine amorphous powder, often moulded into conical drops, odorless and tasteless. *Solubility.*—Almost insoluble in water; insoluble in Alcohol; soluble in diluted Acetic, Hydrochloric, or Nitric acids, with copious effervescence, leaving but a trifling residue.

INCOMPATIBLES.—Acids, alum, ammonium chloride, sulphates, tartar emetic.

Dose, 1 gm. (15 gr.).

Preparations.

1. Hydrargyrum cum Creta, *see* Hydrargyrum.

2. Mistura Cretæ.—Chalk Mixture. Compound Chalk Powder, 20; Cinnamon Water, 40; Water to make 100.

Dose, 16 c.c. (4 fl. dr.).

3. Pulvis Cretæ Compositus.—Compound Chalk Powder. Prepared Chalk, 30; powdered Acacia, 20; powdered Sugar, 50.

Dose, 2 gm. (30 gr.).

2. CALCII CARBONAS PRÆCIPITATUS.—Precipitated Calcium Carbonate. $CaCO_3 = 99.35$. It should contain not less than 99 per cent. of pure Calcium Carbonate.

SOURCE.—From Calcium Chloride and Sodium Carbonate, and drying the precipitate. $CaCl_2 + Na_2CO_3 = 2NaCl + CaCO_3$.

CHARACTERS.—A fine, white powder, odorless and tasteless. *Solubility.*—Nearly insoluble in water; the solubility is increased by the presence of Ammonium salts, and especially by Carbon Dioxide.

IMPURITIES.—Heavy metals, iron, alumina, phosphates.

INCOMPATIBLES.—The same as for Creta Præparata.

Dose, 1 gm. (15 gr.).

Precipitated Calcium Carbonate is used to prepare Pulvis Morphinæ Compositus and Syrupus Calcii Lactophosphatis.

ACTION.

Desiccant; astringent; antacid; absorbent.

Uses.

Prepared chalk is employed as a dentifrice; also as a dusting powder for moist surfaces and as a protective dressing for ulcers and sores. Chalk mixture, compound chalk powder, and mercury with chalk are useful in diarrhœal disorders, especially in children. Calcium carbonate is given as a restorative and antacid in acid indigestion. Contrexéville and other natural mineral waters containing salts of calcium are largely used in the treatment of uric acid gravel and other affections of the urinary system.

3. CALX.—Lime. Calcium Oxide. $CaO = 55.68$. *Synonym.*—Burned Lime. It contains, when in the anhydrous state, not less than 90 per cent. of pure Calcium Oxide.

SOURCE.—Made by calcining white marble, or the purest varieties of natural Calcium Carbonate, to expel Carbon Dioxide.

CHARACTERS.—Hard, white or grayish-white masses, which in contact with air gradually attract moisture and Carbon Dioxide, and fall to a white powder (slaked lime); odorless and having a caustic taste. *Solubility.*—In about 760 parts of water and in about 1600 of boiling water; insoluble in Alcohol.

IMPURITY.—The carbonate.

Preparations.

1. **Linimentum Calcis.**—Lime Liniment. *Synonym.*—Carron Oil. Lime Water, Linseed Oil, of each, one volume. Mix them by agitation.

2. **Liquor Calcis.**—Lime Water. Solution of Calcium Hydroxide. *Synonym.*—Solution of Lime. A saturated aqueous solution, which should contain not less than 0.14 per cent. of pure Calcium Hydroxide [$Ca(OH)_2 = 73.56$].

SOURCE.—Made from slaked lime by solution.

IMPURITIES.—Alkalies and their carbonates.

Dose, 16 c.c. (4 fl. dr.).

Lime Water is contained in Mucilago Acaciæ.

3. **Syrupus Calcis.**—Syrup of Lime. Syrup of Calcium Hydroxide. Lime, 65; Sugar, 350; Water, to 1000.

Dose, 2 c.c. (30 ♏).

Action.

Disinfectant; caustic; antacid; astringent.

Uses.

Lime is used as a caustic (chiefly with caustic potash or soda). Lime water is locally applied to relieve itching and given by injection for thread-worms, leucorrhœa, gleet and ulcerations of the bladder. In the form of a spray it is used to break down false membranes in diphtheria, croup, plastic bronchitis, etc., and Carron oil is a standard remedy for burns. Internally lime water is much used to allay vomiting, and it is constantly added to the milk of infants and invalids to prevent the formation of bulky coagula. Other uses of lime: Acid poisoning, diarrhœa, rachitis, osteomalacia, hæmophilia and aneurism.

4. CALCII PHOSPHAS PRÆCIPITATUS.—Precipitated Calcium Phosphate. $Ca_3(PO_4)_2 = 307.98$. It should contain not less than 99 per cent. of pure Calcium Phosphate $[(PO \cdot O_3)_2Ca_3]$.

Source.—Made from Bone Ash (impure Calcium Phosphate) digested with diluted Hydrochloric acid, made alkaline with solution of Ammonia, and by precipitation.

Characters.—A bulky, white, amorphous powder, odorless and tasteless, and permanent in the air. *Solubility.*—Almost insoluble in water; partly decomposed by boiling water, which dissolves out the acid salt; insoluble in Alcohol; easily soluble in Hydrochloric or Nitric acid.

Impurities.—The chloride and carbonate, acid calcium phosphate, barium, arsenic, cyanides, heavy metals.

Dose, 1 gm. (15 gr.).

Preparations.

Syrupus Calcii Lactophosphatis.—Syrup of Calcium Lactophosphate. Precipitated Calcium Carbonate, 25; Phosphoric Acid, 36; Lactic Acid, 60; Orange Flower Water, 50; Sugar, 725; Water, to 1000.

Dose, 8 c.c. (2 fl. dr.).

Action.

Calcium phosphate is a very important constituent of the body, and in all the solid tissues it is of service by giving to them proper consistence and solidity.

Uses.

Richets, mollities ossium, tuberculosis, scrofula and anæmic conditions generally.

5. CALCII CHLORIDUM.—Calcium Chloride. $CaCl_2 = 110.16$. It should contain not less than 99 per cent. of pure Calcium Chloride, and should be kept in well-stoppered bottles.

SOURCE.—Obtained by neutralizing Hydrochloric Acid with Calcium Carbonate and evaporating. $CaCO_3 + 2HCl = CaCl_2 + CO_2 + H_2O$. This is rendered anhydrous by fusion at the lowest possible temperature.

CHARACTERS.—White, slightly translucent, hard fragments, odorless, having a sharp saline taste, and very deliquescent. *Solubility.*—In 1.3 parts of water and 8 of Alcohol; in 1.5 of boiling Alcohol; very freely in boiling water.

IMPURITIES.—Arsenic, barium, lead, iron, alumina, phosphates, magnesium, alkalies.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

ACTION.

Irritant; resolvent. Outside the body it hastens the coagulation of blood and produces a firmer clot.

USES.

Chronic bronchitis; pneumonia; gastric catarrh; fermentative dyspepsia; hæmatemesis, hæmoptysis and the hæmorrhages of scurvy and hæmophilia; lupus and other skin diseases.

6. CALCII BROMIDUM, *see* Bromine.

7. CALX CHLORINATA, *see* Chlorine.

8. CALCII HYPOPHOSPHIS, *see* Phosphorus.

9. CALX SULPHURATA, *see* Sulphur.

10. CALCII SULPHAS EXSICCATUS.—Exsiccated Calcium Sulphate. *Synonym.*—Plaster of Paris. A powder containing about 95 per cent., by weight, of Calcium Sulphate ($CaSO_4 = 135.15$), and about 5 per cent. of water.

SOURCE.—Prepared from the purer varieties of native Gypsum ($CaSO_4 + 2H_2O = 171.91$), by carefully heating until about three-fourths of the water has been expelled.

CHARACTERS.—A fine white powder, without taste or odor, and when mixed with half its weight of water it forms a smooth paste, which rapidly hardens. From moist air it attracts water, becomes granular, and then loses the property of hardening with water. *Solubility.*—In about 378 parts of water; readily in diluted Hydrochloric or Nitric acid and in saturated solutions of Potassium Nitrate, Sodium Thiosulphate, and various Ammonium salts; insoluble in Alcohol.

Dried Calcium Phosphate is used to prepare Calx Sulphurata.

ACTION.

None.

USES.

For making immovable bandages and also casts of deformities and injuries.

II. STRONTIUM.

Sr = 86.94.

1. **STRONTII BROMIDUM,** *see* Bromine.
2. **STRONTII IODIDUM,** *see* Iodine.
3. **STRONTII SALICYLAS,** *see* Salicylic Acid.

III. BARIUM.

Ba = 136.4.

Unofficial Preparations.

1. **Barii Chloridum.**—Barium Chloride. $BaCl_2 + 2H_2O = 242.52$.

SOURCE.—Obtained (1) by adding Barium Carbonate gradually to diluted Hydrochloric Acid. Towards the close of the effervescence set up gentle heat is applied, and when chemical action has ceased, the liquor is filtered and then evaporated, so that crystals may form when it cools. (2) Barium Sulphate, previously ignited and powdered, is mixed with Charcoal and exposed to a low white heat, by which its constituents are deoxidized, and Barium Sulphide produced. The Barium Sulphide, after having been dissolved in water, is decomposed by the addition of Hydrochloric Acid; Hydrogen Sulphide being evolved and Barium Chloride formed in solution. (1) $BaCO_3 + 2HCl = BaCl_2 + H_2O + CO_2$. (2) $BaSO_4 + C_4 = BaS + (CO)_4$. $BaS + 2HCl = BaCl_2 + H_2S$.

CHARACTERS.—A permanent colorless salt, with a bitter and disagreeable taste, and crystallizing in rhombic tables with bevelled edges. *Solubility.*—It dissolves in about two and a half times its own weight of cold water, and in a little more than its own weight at 106° C. (222.8° F.).

Dose, 0.006 to 0.03 gm. ; $\frac{1}{10}$ to $\frac{1}{2}$ gr.

2. **Barii Dioxidum.**—Barium Dioxide. $BaO_2 = 168.82$.

SOURCE.—By conducting oxygen over Barium Oxide, heated to full redness.

CHARACTERS.—A heavy, grayish-white, or pale, yellowish-white, amorphous, coarse powder, odorless and tasteless. When ex-

posed to the air it slowly attracts moisture and Carbon Dioxide, and is gradually decomposed. *Solubility.*—Almost insoluble in water.

IMPURITIES.—Sulphates and nitrates.

INCOMPATIBLES.—Hydrochloric, phosphoric and most other mineral acids.

Barium Dioxide is used in preparing Aqua Hydrogenii Dioxidi.

3. **Barii Sulphidum.**—Barium Sulphide. BaS = 168.23. A white powder, readily soluble in water, which is obtained by heating Barium Oxide (BaO) in Hydrogen Sulphide gas.

ACTION.

Barium salts slow and increase the force of the heart's action, and cause constriction of the vessels and a rise of blood-pressure. They also have an action on muscular tissue resembling that of veratrine.

USES.

Barium dioxide is used only for the purpose mentioned above. The chloride has been employed for mitral insufficiency, hæmorrhage, and atony of the bladder or intestine, and the sulphide as a depilatory.

2. Magnesium, Zinc, Mercury.

I. MAGNESIUM.

Mg = 24.18.

1. **MAGNESII SULPHAS.**—Magnesium Sulphate. $MgSO_4 + 7H_2O$ = 244.69. *Synonym.*—Epsom Salt. It should contain not less than 99.7 per cent. of pure Magnesium Sulphate ($SO_2 \cdot O_2Mg + 7H_2O$), and should be kept in well-closed vessels.

SOURCE.—It is obtained from (1) Dolomite (native Calcium and Magnesium Carbonate); or (2) Magnesite (native Magnesium Carbonate), by the action of Sulphuric Acid. (1) $CO_3 + MgSO_4 + 2H_2SO_4 = MgSO_4 + CaSO_4 + 2H_2O \cdot CO_2$; or (2) $MgCO_3 + H_2SO_4 = MgSO_4 + H_2O + CO_2$. Treat with water, filter and evaporate the filtrate to crystallization.

CHARACTERS.—Small, colorless, rhombic prisms or prismatic needles, very like Zinc Sulphate, but moister, and of a saline, bitter taste, whilst that of the Zinc salt is metallic. *Solubility.*—In 1.1 parts of water and in 0.13 part of boiling water; insoluble in Alcohol

IMPURITIES.—Arsenic, heavy metals.

INCOMPATIBLES.—Alkalies, arsenates, carbonates, phosphoric acid,

phosphates, lime water, lead acetate, silver nitrate, sulphites, tartrates. The same incompatibles apply to other Magnesium salts.

Dose, 16 gm. (240 gr.).

Magnesium Sulphate is contained in Infusum Sennæ Compositum.

Preparation.

Magnesii Sulphas Effervescens.—Effervescent Magnesium Sulphate. Magnesium Sulphate, 500; Sodium Bicarbonate, 403; Tartaric Acid, 211; Citric Acid, 136. The Magnesium Sulphate, dried until it ceases to lose moisture, is powdered and mixed intimately with the Citric Acid and Tartaric Acid, dried and powdered, and the Sodium Bicarbonate is then thoroughly incorporated. The mixture is placed in an oven heated to between 90° and 104° C. (199.4° and 219.2° F.), and when it has acquired a moist consistence, by the aid of careful manipulation with a wooden spatula, it is rubbed through a sieve, and the granules dried at a temperature not exceeding 54° C. (129.2° F.).

Dose, 16 gm. (240 gr.).

2. **MAGNESII CARBONAS.**—Magnesium Carbonate. Approximately $(MgCO_3)_4.Mg(OH)_2 + 5H_2O = 482.26$. Magnesium Carbonate $[(CO.O_2\text{-}Mg)_4.Mg(OH)_2 + 5H_2O]$ should yield, upon ignition, not less than 40 per cent. of residue, of which not less than 96 per cent. should consist of pure Magnesium Oxide.

SOURCE.—Mix strong, boiling aqueous solutions of Magnesium Sulphate and Sodium Carbonate, and evaporate. $4MgSO_4 + 4Na_2CO_3 + H_2O = (MgCO_3)_4, Mg(OH)_2 + 4Na_2SO_4 + CO_2$. Digest with water, filter and dry.

CHARACTERS.—Light, white friable masses, or a bulky white powder, without odor, and having a slightly earthy taste. *Solubility.*—Practically insoluble in water, to which, however, it imparts a slightly alkaline reaction; insoluble in Alcohol, but soluble in dilute acids with effervescence.

IMPURITIES.—Calcium, iron, heavy metals, foreign soluble salts.

Dose, 3 gm. (45 gr.).

Magnesium Carbonate is used to prepare Magnesii Oxidum and Syrupus Aurantii, Picis Liquidæ, Tolutanus, and Zingiberis.

Preparation.

Liquor Magnesii Citratis.—Solution of Magnesium Citrate. Dissolve Magnesium Carbonate, 15; in a solution of Citric Acid, 33, in water, 120; filter into a strong bottle containing Syrup of Citric Acid, 60; then add enough water to nearly fill the bottle, which should have a capacity of about 360 c.c., drop in Potassium Bicarbonate, 2.5, and immediately stopper the bottle securely. This

solution should be freshly prepared when wanted. It effervesces when uncorked.

Dose, 360 c.c. (12 fl. oz.).

3. MAGNESII OXIDUM.—Magnesium Oxide. Magnesia. MgO = 40.06. *Synonyms.*—Calcined Magnesia, Light Magnesia. It should contain, after ignition, not less than 96 per cent. of pure Magnesium Oxide and should be kept in well-closed vessels.

SOURCE.—By heating the official Magnesium Carbonate; water and Carbon Dioxide are given off, and Magnesium Oxide remains behind. $4(MgCO_3)$, $Mg(OH)_2 + 5H_2O = 5MgO + 4CO_2 + 6H_2O$.

CHARACTERS.—A white, very bulky, and very fine powder, without odor, and having an earthy, but not saline, taste. On exposure to the air it slowly absorbs moisture and Carbon Dioxide. *Solubility.*—Almost insoluble in water; insoluble in Alcohol; soluble in dilute acids.

IMPURITIES.—Magnesium carbonate, iron, calcium, heavy metals, foreign soluble salts.

INCOMPATIBLES.—Acids, copaiba (forms a solid mass), water.

Dose, 2 gm. (30 gr.).

Magnesium Oxide is used to prepare Heavy Magnesia *and is contained in* Ferri Hydroxidum cum Magnesii Oxido, Fluidextractum Rhamni Purshianæ Acomaticum, and Pulvis Rhei Compositus.

4. MAGNESII OXIDUM PONDEROSUM. — Heavy Magnesium Oxide. Heavy Magnesia. MgO = 40.06.

SOURCE.—From Magnesia by trituration for some time in the presence of strong Alcohol, drying, and rubbing to powder.

CHARACTERS.—A white, dense and very fine powder, which should correspond to the tests for Magnesia, from which it differs in not readily uniting with water to form a gelatinous hydroxide.

Dose, 2 gm. (30 gr.).

ACTION.

Antacid; purgative. Magnesium sulphate is much the most powerfully cathartic. Magnesium oxide and magnesium carbonate are diuretic, and also tend to promote the alkalinity of the blood and urine.

USES.

Magnesium oxide and magnesium carbonate are given for sick headache, acidity and constipation, and for the digestive derangements of children. The sulphate is one of the best and most largely employed of saline cathartics. It is used also in the treatment of dysentery. The citrate is a very agreeable laxative.

5. TALCUM.—Talc. *Synonyms.*—French Chalk. Soapstone. A native hydrous Magnesium Silicate.

CHARACTERS.—A white or grayish-white powder, or grayish-green irregular masses of waxy lustre; when rubbed upon the skin it imparts a feeling like greasiness; odorless and tasteless. Sp. gr. 2.2 to 2.8.

IMPURITIES.—Aluminum hydroxide, magnesium.

Preparation.

Talcum Purificatum.—Purified Talc. Talc, 500; Hydrochloric Acid, 75; Water, a sufficient quantity. By boiling, decanting, filtering and drying.

IMPURITIES.—Soluble substances, iron.

ACTION.

None.

USES.

In pharmacy.

II. ZINCUM.

$Zn = 64.9$.

1. ZINCUM.—Zinc. It should contain not less than 99 per cent. of pure metallic Zinc.

SOURCE.—Roast the native Zinc Sulphide or Carbonate, and reduce the resulting Oxide with the Charcoal.

CHARACTERS.—A bluish-white metal, showing a crystalline fracture; in the form of thin sheets, or irregular, granulated pieces, or moulded into thin pencils, or in fine powder; having a specific gravity ranging from 6.9 when it is cast to 7.2 after it is rolled.

IMPURITIES.—Sulphur, arsenic, antimony, phosphorus, cadmium, lead, copper, iron.

2. ZINCI CHLORIDUM.—Zinc Chloride. $ZnCl_2 = 135.26$.

Synonym.—Butter of Zinc. It should contain, when anhydrous, not less than 99.5 per cent. of pure Zinc Chloride, and should be kept in small, glass-stoppered bottles.

SOURCE.—Digest Zinc and distilled water with Hydrochloric Acid; add Nitric Acid, and heat; after cooling, dissolve in distilled water, and add precipitated Zinc Carbonate; evaporate until a portion of the liquid, withdrawn and cooled, forms an opaque solid. $Zn_2 + 4HCl = 2ZnCl + 2H_2$.

CHARACTERS.—A white, or nearly white, granular powder, or porcelain-like masses, irregular, or moulded into pencils; odorless; of such intensely caustic properties as to make *tasting dangerous*, unless the salt be dissolved in much water. The dilute solution has an astringent. metallic taste. Very

deliquescent. *Solubility.*—In about 0.4 part of water; very soluble in Alcohol.

IMPURITIES.—The oxychloride and sulphate, arsenic, cadmium, lead, copper.

3. LIQUOR ZINCI CHLORIDI.—Solution of Zinc Chloride.

SOURCE.—Prepared as above, without the evaporation.

CHARACTERS.—A clear, colorless liquid of an astringent, metallic taste, and an acrid reaction. Sp. gr. about 1.548. It contains about 50 per cent., by weight, of the salt.

ACTION.

Corrosive, antiseptic; solutions of moderate strength are excitant, astringent and slightly hæmostatic.

USES.

An effective caustic for morbid growths, and a useful disinfectant. Has been employed as a stimulant injection for tuberculous joints and lupus, and to promote the union of fractured bones.

4. ZINCI SULPHAS.—Zinc Sulphate. $ZnSO_4 + 7H_2O = 285.41$.

Synonym.—White Vitriol. It should contain, in uneffloresced crystals, not less than 99 per cent. of pure Zinc Sulphate ($SO_2 \cdot O_2Zn + 7H_2O$), and should be kept in well-stoppered bottles.

SOURCE.—Treat Zinc with dilute Sulphuric Acid; filter and add gradually a solution of Chlorine; add Zinc Carbonate, and agitate; filter, slightly acidify with dilute Sulphuric Acid, and evaporate the filtrate.

CHARACTERS.—Colorless, transparent, rhombic crystals, or a granular crystalline powder, without odor, very like Magnesium Sulphate (*see* p. 124), but having an astringent, metallic taste. *Solubility.*—In 0.53 part of water and in 0.2 part of boiling water; in about 3 parts of Glycerin; insoluble in Alcohol.

IMPURITIES.—Lead, copper, cadmium, arsenic, free acid, zinc chloride.

INCOMPATIBLES.—Alkalies and their carbonates, acacia, arsenates, cyanides, lime water, lead acetate, silver nitrate, astringent vegetable infusions or decoctions, phosphates, sulphides, sulphates, milk. The same incompatibles apply to other zinc salts.

Dose (emetic), **1 gm. (15 gr.).**

5. ZINCI CARBONAS PRÆCIPITATUS.—Precipitated Zinc Carbonate. Hydrated Zinc Carbonate, which, upon ignition, should yield not less than 72 per cent. of Zinc Oxide.

SOURCE.—Boil together solutions of Zinc Sulphate and Sodium Carbonate. $3ZnSO_4 + 3Na_2CO_3 + 2H_2O = 2(ZnCO_3)_3Zn(OH)_2 + 2CO_2 + 3Na_2SO_4$. Dry the precipitated Zinc Salt.

CHARACTERS.—An impalpable, white powder, of somewhat variable chemical composition, without odor or taste. Similar in constitution to Magnesium Carbonate. *Solubility.*—Insoluble in water or Alcohol; completely soluble in diluted acids with copious effervescence; also soluble in Ammonia Water and in Ammonium Carbonate Test Solution.

IMPURITIES.—Copper, lead, arsenic, cadmium, free alkali.

Zinc Carbonate is rarely used except to make other Zinc salts.

6. ZINCI OXIDUM.—Zinc Oxide. $ZnO = 80.78$. It should contain not less than 99.5 per cent. of pure Zinc Oxide.

SOURCE.—Heat the precipitated Carbonate to redness in a crucible. $2(ZnCO_3)_3Zn(OH)_2 = 3ZnO + 3H_2O + CO_2$.

CHARACTERS.—A very fine, amorphous, white or yellowish-white powder, free from gritty particles, without odor or taste; it gradually absorbs Carbon Dioxide from the air. *Solubility.*—Insoluble in water or Alcohol; completely soluble, without effervescence, in diluted acids; also in Ammonia Water and in Ammonium Carbonate T. S.

IMPURITIES.—The same as in the carbonate, with the addition of zinc sulphate and chloride.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Preparation.

Unguentum Zinci Oxidi.—Ointment of Zinc Oxide. *Synonym.*—Zinc Ointment. Zinc Oxide, 200; Benzoinated Lard, 800. Rub the Zinc Oxide with an equal weight of melted Benzoated Lard, and with this incorporate the remainder of the Benzoated Lard, previously melted.

7. ZINCI ACETAS.—Zinc Acetate. $Zn(C_2H_3O_2)_2 + 2H_2O = 217.82$. It should contain in the uneffloresced condition not less than 99.5 per cent. of pure Zinc Acetate $[(CH_3 \cdot COO)_2Zn + 2H_2O]$, and should be kept in well-stoppered bottles.

SOURCE.—Dissolve Zinc Oxide in Acetic Acid and water, and boil. $ZnO + 2HC_2H_3O_2 = Zn(C_2H_3O_2)_2 + 2H_2O$. Zinc Acetate crystallizes out.

CHARACTERS.—Soft, white, six-sided monoclinic plates, of a pearly lustre, having a faintly acetous odor, and in dilute solutions an astringent, metallic taste. *Solubility.*—In about 2.5 parts of water and 1.5 of boiling water; in 36 of Alcohol and 0.6 part of boiling Alcohol.

IMPURITIES.—Those of the oxide.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

ACTION.

Astringent; mildly hæmostatic; irritant; emetic. The most active salts are the sulphate and acetate.

Uses.

The sulphate and acetate are used as astringent injections and applications in gonorrhœa, leucorrhœa, gleet, otitis, conjunctivitis, etc., and the others, in powder or ointment, are employed in a great variety of conditions where a mild astringent effect is desired. The ointment of zinc oxide is perhaps more widely used than any other in the treatment of acute skin diseases. Internally the sulphate is a serviceable emetic in narcotic and other poisoning, and it and the oxide are used in digestive derangements, diarrhœa, dysentery, etc. The oxide has been given for the night-sweats of phthisis and in various nervous diseases.

Toxicology.—The symptoms are those of gastro-intestinal irritation. *Treatment.*—Lime water, mucilaginous drinks, albumin. Emetics are seldom required on account of the prompt and copious vomiting usually caused by the salt.

8. ZINCI BROMIDUM. *See* Bromine.

9. ZINCI IODIDUM. *See* Iodine.

10. ZINCI PHENOLSULPHONAS. *See* Phenol.

11. ZINCI STEARAS. *See* Stearic Acid.

12. ZINCI VALERAS. *See* Valeriana.

III. HYDRARGYRUM.

Hg = 198.50.

1. HYDRARGYRUM.—Mercury. *Synonym.*—Quicksilver. It should contain not less than 99.9 per cent. of pure metallic Mercury, and should be kept in strong, well-stoppered bottles.

Source.—Cinnabar, the native Sulphide, is roasted or distilled with Lime; the volatile Mercury is condensed in suitable aludels.

Characters.—A shining, silver-white metal, without odor or taste, and easily divisible into spherical globules. Sp. gr. 13.585. *Solubility.*—Insoluble in the ordinary solvents, but it dissolves in Sulphuric Acid when boiled with it, and is completely soluble in Nitric Acid.

Impurities.—Foreign metals.

Preparations.

1. Emplastrum Hydrargyri.—Mercurial Plaster. Mercury, 30; Oleate of Mercury, 1; Hydrous Wool-Fat, 10; Lead Plaster, 59. *Strength.*—30 per cent. of Mercury.

2. Hydrargyrum cum Creta.—Mercury with Chalk. *Synonym.*—Gray powder.

By trituration of Mercury, 38; Prepared Chalk, 57; Clarified honey, 10; with sufficient water to make 100. By keeping, the Mercury is liable to become Mercuric Oxide, which makes the powder more active. *Strength.*—38 per cent. of Mercury.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

3. Massa Hydrargyri.—Mass of Mercury. *Synonyms.*—Blue Mass, Blue Pill. Mercury, 33; Honey of Rose, 33; Glycyrrhiza, 10; Althæa, 15; Glycerin, 9. *Strength.*—33 per cent. of Mercury.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

4. Unguentum Hydrargyri.—Mercurial Ointment. Mercury, 500; Benzoinated Lard, 250; Prepared Suet, 230; Oleate of Mercury, 20. *Strength.*—50 per cent. of Mercury.

5. Unguentum Hydrargyri Dilutum.—Blue Ointment (the Undiluted Mercurial Ointment was formerly known as Blue Ointment). Mercurial Ointment, 670; Petrolatum, 330.

2. HYDRARGYRI OXIDUM RUBRUM.—Red Mercuric Oxide. $HgO = 214.38$. *Synonym.*—Red Precipitate. It should contain not less than 99.5 per cent. of pure Red Mercuric Oxide, and should be kept in well-stoppered bottles, protected from light.

SOURCE.—Dissolve Mercury in diluted Nitric Acid. $3Hg + 8HNO_3 = 3Hg(NO_3)_2 + 2NO + 4H_2O$. Evaporate to dryness. Triturate the Mercuric Nitrate thus formed, with Mercury, and heat. $2Hg(NO_3)_2 + 2Hg = 4HgO + 2N_2O_4$.

CHARACTERS.—Heavy, orange-red, crystalline scales, or a crystalline powder, having a somewhat metallic taste. *Solubility.*—Almost insoluble in water; insoluble in Alcohol, but readily soluble in diluted Nitric Acid.

IMPURITIES.—Mercuric nitrate, yellow mercuric oxide, chlorides, arsenic, foreign salts, heavy metals.

INCOMPATIBLES.—Mineral acids, hydrated chloral, mercuric chloride.

Preparation.

Unguentum Hydrargyri Oxidi Rubri.—Ointment of Red Mercuric Oxide. *Synonym.*—Red Precipitate Ointment. Red Mercuric Oxide, 10; Water, 10; Hydrous Wool-Fat, 40; Petrolatum, 40.

3. HYDRARGYRI OXIDUM FLAVUM.—Yellow Mercuric Oxide. $HgO = 214.38$. It should contain not less than 99.5 per cent. of pure Yellow Mercuric Oxide.

SOURCE.—**Precipitate a solution of Corrosive Mercuric Chloride, 100; with Sodium Hydroxide, 40.** $HgCl_2 + 2NaOH = HgO + 2NaCl + H_2O$.

CHARACTERS.—**A light orange-yellow, amorphous, heavy, impalpable powder, having a somewhat metallic taste. It has the same composition as the Red Oxide, but is more crystalline.**

IMPURITIES.—**Red mercuric oxide and, in addition, the impurities mentioned under the latter salt.**

Preparations.

1. **Unguentum Hydrargyri Oxidi Flavi.**—Ointment of Yellow Mercuric Oxide. **Yellow Mercuric Oxide, 10; Water, 10; Hydrous Wool-Fat, 40; Petrolatum, 40.**

2. **Oleatum Hydrargyri.**—Oleate of Mercury. **Yellow Mercuric Oxide, 25; Distilled Water, 25; Oleic Acid, to 100.**

Oleate of Mercury is contained in **Unguentum Hydrargyri** and **Emplastrum Hydrargyri.**

4. **HYDRARGYRI CHLORIDUM CORROSIVUM.**—Corrosive Mercuric Chloride. $HgCl_2 = 268.86$. *Synonyms.*—Corrosive Sublimate. Mercuric Bichloride. It should contain not less than 99.5 per cent. of pure Mercuric Chloride, and should be kept in well-stoppered bottles.

SOURCE.—Heat a mixture of Mercuric Sulphate, Sodium Chloride, and Manganese Dioxide. $HgSO_4 + 2NaCl + MnO_2 = HgCl_2 + Na_2SO_4 + MnO_2$. The Corrosive Chloride sublimes and is condensed. The object of the Manganese Dioxide is to prevent the formation of Mercurous Chloride by setting free Chlorine which will convert it into Mercuric Chloride.

CHARACTERS.—Heavy, colorless, rhombic crystals, or crystalline masses, having an acrid and persistent metallic taste. *Solubility.*—When in fine powder, in 13 parts of water and 2 of boiling water; in 3 parts of Alcohol and 1.2 of boiling Alcohol; in about 14 parts of Glycerin.

IMPURITIES.—Arsenic, foreign salts and metals.

INCOMPATIBLES.—Alkalies and their carbonates, alkaloids, arsenous salts, bromides, copper and ferrous salts, iodides, lime water, tartar emetic, silver nitrate, lead acetate, albumin, soaps, vegetable preparations containing tannic acid, and in fact most substances. The same incompatibles apply to Mercuric Iodide.

Dose, 0.003 gm. = 3 milligm. ($\frac{1}{20}$ gr.).

Unofficial Preparation.

Lotio Hydrargyri Flava.—Yellow Mercurial Lotion. *Synonym.*—Yellow Wash. Corrosive Mercuric Chloride, 0.46 gm.; Lime Water, 100 c.c.

5. **HYDRARGYRI CHLORIDUM MITE.**—Mild Mercurous Chloride. $HgCl = 233.68$. *Synonym.*—Calomel. It should contain not less than

99.5 per cent. of pure Mercurous Chloride, and should be kept in dark amber-colored bottles.

SOURCE.—Rub Mercury with Mercuric Sulphate to form Mercurous Sulphate, Hg_2SO_4. Add Sodium Chloride, and then heat, the Calomel sublimes, $Hg_2SO_4 + 2NaCl = 2HgCl + Na_2SO_4$.

CHARACTERS.—A white, impalpable powder, becoming yellowish-white on being triturated with strong pressure, and without odor or taste. Insoluble in water, Alcohol, Ether, or cold dilute acids.

IMPURITIES.—Mercuric chloride, ammoniated mercury, arsenic, heavy metals, foreign salts.

INCOMPATIBLES.—Alkalies, mineral acids, citric and hydrocyanic acids, chlorides, and most of the substances incompatible with mercuric chloride. The same incompatibles apply to Mercurous Iodide.

Dose (laxative), **0.125 gm. = 125 milligm. (2 gr.)**; (alterative) **0.065 gm. = 65 milligm. (1 gr.).**

Preparation.

Pilulæ Catharticæ Compositæ.—Compound Cathartic Pills. Mild Mercurous Chloride, 60; Compound Extract of Colocynth, 80; Resin of Jalap, 20; Gamboge, 15 gm.; Diluted Alcohol, a sufficient quantity, to make 1000 pills.

Dose, 2 pills.

Unofficial Preparation.

Lotio Hydrargyri Nigra.—Black Mercurial Lotion. *Synonym.*—Black Wash. Calomel, 1; Glycerin, 8; Mucilage of Tragacanth, 20; Lime Water to 160.

6. HYDRARGYRI IODIDUM RUBRUM.—Red Mercuric Iodide. $HgI_2 = 450.30$. It should contain not less than 99.5 per cent. of pure Mercuric Iodide.

SOURCE.—Mix Corrosive Mercuric Chloride, 40, dissolved in distilled water, 800, and Potassium Iodide, 50, dissolved in distilled water, 800, with distilled water, 2000. Filter and dry the precipitated Red Iodide. $HgCl_2 + 2KI = HgI_2 + 2KCl$.

CHARACTERS.—A scarlet-red, amorphous powder, odorless and tasteless. *Solubility.*—Almost insoluble in water; soluble in 116 parts of Alcohol, 85 of Ether, and 1340 of Chloroform; in 15 of boiling Alcohol; also in solutions of the soluble iodides, mercuric chloride, sodium thiosulphate, and hot solutions of the alkali chlorides.

IMPURITIES.—Chlorides and iodides, mercuric chloride.

Dose, 0.003 gm. = 3 milligm. ($\frac{1}{20}$ gr.).

Preparation.

Liquor Arseni et Hydrargyri Iodidi.—Solution of Arsenous and Mercuric Iodides. *Synonym.*—Donovan's Solution. Dis-

solve Arsenous Iodide, 10, and Red Mercuric Iodide, 10, in distilled water, 150. Filter, and pass sufficient distilled water through the filter to make 1000.

CHARACTERS.—A clear or pale yellowish liquid, having a disagreeable, metallic taste. *Strength.*—1 per cent. of each Iodide.

Dose, 0.1 c.c. (1½ m).

7. **HYDRARGYRI IODIDUM FLAVUM.**—Yellow Mercurous Iodide. HgI = 324.40. *Synonym.*—Green Mercurous Iodide. It should contain not less than 99.5 per cent. of pure Mercurous Iodide.

SOURCE.—By pouring a solution of Potassium Iodide, 16, in distilled water, 32, into a solution of Mercurous Nitrate, 40, in Nitric Acid, 6, and distilled water, 650. The precipitate is washed and dried. The Mercurous Nitrate is obtained from Mercury treated by a solution of Nitric Acid in distilled water, by filtration. $Hg(NO_3) + 2KI = 2HgI + KNO_3$.

CHARACTERS.—A bright yellow, amorphous powder, odorless and tasteless. *Solubility.*—Almost insoluble in water, and wholly insoluble in Alcohol or Ether.

IMPURITY.—Mercuric iodide.

Dose, 0.010 gm. = 10 milligm. (⅙ gr.).

8. **LIQUOR HYDRARGYRI NITRATIS.**—Solution of Mercuric Nitrate. A liquid which should contain about 60 per cent. of Mercuric Nitrate, [$Hg(NO_3)_2 = 321.64$], and about 11 per cent. of free Nitric Acid.

SOURCE.—Dissolve Red Mercuric Oxide, 40, in Nitric Acid, 45, mixed with distilled water, 15.

CHARACTERS.—A clear, nearly colorless, heavy liquid, having a faint odor of Nitric Acid and a strongly acid reaction. Sp. gr. about 2.086.

IMPURITY.—Mercurous Nitrate.

9. **UNGUENTUM HYDRARGYRI NITRATIS.**—Ointment of Mercuric Nitrate. *Synonym.*—Citrine Ointment.

SOURCE.—Mix a hot solution of Mercury, 70, in Nitric Acid, 175, with Lard, 760.

10. **HYDRARGYRUM AMMONIATUM.**—Ammoniated Mercury. $HgNH_2Cl = 249.61$. *Synonyms.*—White Precipitate. Mercuric Ammonio-Chloride. It should contain not less than 78 nor more than 80 per cent. of Metallic Mercury.

SOURCE.—Mix Corrosive Mercuric Chloride, 100, dissolved in distilled water, 2000, with Ammonia Water, 150. $HgCl_2 + 2NH_4OH = NH_2HgCl + NH_4Cl + 2H_2O$. Filter, and wash the precipitated Ammoniated Mercury with a mixture of Ammonia water, 20, and distilled water, 400.

CHARACTERS.—White, pulverulent pieces, or a white, amorphous powder, having an earthy, afterwards styptic and metallic taste. *Solubility.*—

Insoluble in water or Alcohol; readily soluble in warm Hydrochloric, Nitric or Acetic Acid, and in a cold solution of Ammonium Carbonate.

IMPURITIES.—Mercurous salt, carbonate, arsenic, heavy metals, foreign salts.

INCOMPATIBLES.—Acids, alkalies, bromine, chlorine, iodine, lime water.

Preparation.

Unguentum Hydrargyri Ammoniati.—Ointment of Ammoniated Mercury. *Synonym.*—White Precipitate Ointment. Ammoniated Mercury, 10; White Petrolatum, 50; Hydrous Wool-Fat, 40.

Unofficial Preparations.

1. Hydrargyri Subsulphas Flavus.—Yellow Mercuric Subsulphate. $Hg(HgO)_2SO_4 = 722.61$. *Synonym.*—Turpeth Mineral.

SOURCE.—By solution of Mercury, 100; Sulphuric Acid, 30; Nitric Acid, 25; water, a sufficient quantity; decantation, drying of the residue.

CHARACTERS.—A heavy, lemon-yellow powder, odorless and almost tasteless. *Solubility.*—In about 2000 parts of water; insoluble in Alcohol.

Dose, .12 to .24 gm.; 2 to 4 gr., as an emetic.

2. Ammonii et Hydrargyri Chloridum.—Ammonio-Mercuric Chloride. *Synonym.*—Sal Alembroth. A double Mercury and Ammonium Chloride.

SOURCE.—Mix 271 parts of Corrosive Mercuric Chloride with 107 of Ammonium Chloride, both in solution, and evaporate.

CHARACTERS.—Flattened rhombic prisms, freely soluble in water or glycerin. It contains one molecule of Corrosive Mercuric Chloride combined with two of Ammonium Chloride. .20 gm. (3 gr.) of Sal Alembroth contains .12 gm. (2 gr.) of Corrosive Mercuric Chloride. It is a very powerful antiseptic, but does not combine with albumin so readily as Corrosive Mercuric Chloride, and is therefore less irritating.

3. Hydrargyri Tannas.—Mercurous Tannate.

SOURCE.—Obtained by precipitating concentrated solution of Tannic Acid and oxydulated Mercurous Nitrate.

CHARACTERS.—Dark-green powder or scales, odorless and tasteless, containing 50 per cent. of Mercury. It is incompatible with alkalies and their carbonates.

Dose, .06 to .12 gm.; 1 to 2 gr.

4. Hydrargyri et Zinci Cyanidum.—Mercury and Zinc Cyanide. This consists of one molecule of Mercuric Cyanide combined with four molecules of Zinc Cyanide.

Characters.—A colorless powder; entirely insoluble in water.

5. Hydrargyrum Colloidale.—Colloidal Mercury. *Synonym.*—Hyrgol.

Source.—A concentrated solution of Ammonium Citrate is added to a mixture composed of dilute solutions of Stannous and Mercurous Nitrates, with a little Nitric Acid; after which Ammonia Water is employed for neutralizing the product.

Characters.—Black, porous masses, forming a dark non-corrosive solution with water. As, when it is rubbed in a mortar, globules of mercury result, it should be first rubbed with water when it is to be used in an ointment.

Dose, .09 to .18 gm.; 1½ to 3 gr.

6. Mercurol.—Mercurol. A chemical combination of Nucleinic Acid (obtained from yeast) and metallic Mercury.

Characters.—A brown powder, soluble in water, but insoluble in Alcohol, containing 10 per cent. of Mercury.

Action of Mercury.

External.—Mercury and many of its salts are inert; the action of others varies from that of a mild stimulant to the effect of a powerful irritant and escharotic. Mercurial salts are germicidal, anti-parasitic, and anti-pruritic. They may be absorbed by the skin, and their vapor by the pulmonary mucous membrane. The corrosive chloride and other soluble salts of mercury are among the most important antiseptics which we possess.

Internal.—Given in sufficient amount, mercurials cause salivation, violent stomatitis, and gastro-enteritis. Small doses of the insoluble salts usually cause loose stools, without any griping or straining, and it is possible for very large doses of calomel to be taken without giving rise to any serious disturbance of the system, as only a small proportion of it is absorbed. The bichloride increases the biliary secretion, but it has not been shown that the other salts are cholagogues. Calomel and some other mercurials have more or less diuretic action. In acute mercurial poisoning, when death does not result in a few hours, anuria frequently occurs as the result of nephritis. Mercury is eliminated principally by the bowels, but also in the urine, saliva, perspiration and milk, and its excretion through the skin may induce various eruptions.

Uses.

Mercurials (especially the bichloride) are extensively used for antiseptic purposes in surgery and midwifery. The acid solution of mercuric nitrate is employed as a caustic for warts, chancroids, mucous patches, etc., and citrine and red precipitate ointments as stimulating applications to ulcers and sores. Mercurial ointments and washes are very serviceable in the treatment of parasitic affections, and also in a variety of other skin diseases, as well as in ophthalmological practice. Internally, blue mass and calomel are largely employed as purgatives, and the latter is a good intestinal antiseptic. It is used in serous and other inflammations, and both it and the bichloride have been given in diphtheria. The most important use of mercury is in the treatment of syphilis. In order to secure the best results in this disease it should be commenced early and continued for a considerable time after all symptoms have disappeared. In tertiary syphilis it is commonly combined with the iodides. *Modes of administration of mercurials:* By the mouth; endermatically; by inunction; hypodermatically; intravenous injection; fumigation; inhalation; baths.

Toxicology. Acute poisoning.—The symptoms are those of violent gastro-enteritis, with hæmatemesis and bloody stools. The urine becomes scanty and contains albumin, blood and casts. *Treatment.*—Prompt evacuation of the stomach, by the stomach-tube if possible; white of egg, milk and flour; tannic acid to protect the mucous membrane. *Chronic poisoning.*—Symptoms: Ptyalism; mercurial palsy; profound cachexia; in some cases ulceration or gangrene of the tongue, lips and cheeks. *Treatment.*—Promote elimination in every possible way; sulphur baths; hot baths; diuretics; potassium or sodium iodide; potassium chlorate as a mouth-wash. The bowels should be kept free, but if diarrhœa is present, opiates, which may also be called for to relieve pain, should be given.

3. Copper, Silver, Gold.

I. CUPRUM.

$Cu = 63.16$.

1. **CUPRI SULPHAS.**—Copper Sulphate. $CuSO_4 + 5H_2O = 247.85$. *Synonyms.*—Blue Vitriol. Bluestone. It should contain not less than 99.5 per cent. of pure Copper Sulphate ($SO_2 \cdot O_2Cu + 5H_2O$).

SOURCE.—Heat Copper and Sulphuric Acid together, and dissolve the soluble product in hot water and evaporate. $Cu_2 + 4H_2SO_4 = 2CuSO_4 + 4H_2O + 2SO_2$.

CHARACTERS.—Large, transparent, deep blue, triclinic crystals; odorless; of a nauseous, metallic taste. *Solubility.*—In about 2.2 parts of water and 0.5 part of boiling water; in 400 parts of Alcohol and 3.5 of Glycerin.

IMPURITIES.—Iron, aluminum, heavy metals.

INCOMPATIBLES.—Alkalies and their carbonates, lime water, mineral salts (except sulphates), iodides and most vegetable astringents.

Dose (astringent), **0.010 gm. = 10 milligm.** (⅙ **gr.**); (emetic) **0.250 gm. = 250 milligm.** (**4 gr.**).

Copper Sulphate is used in preparing Trommer's and Fehling's tests for sugar.

ACTION.

Externally, somewhat corrosive in substance; in solution acts like zinc sulphate, but is more strongly astringent and antiseptic. Internally, emetic; more irritant than zinc sulphate. In large doses corrosive, causing violent vomiting and purging; in small doses markedly astringent. Copper is excreted in the intestinal secretions, bile, urine, saliva and milk, and is said to pass from the mother to the fœtus in utero.

USES.

A mild and useful caustic; also employed to check slight hæmorrhages. Lotions of copper sulphate are used for the same purposes as those made with zinc sulphate. As an ointment it is applied in parasitic and other skin diseases. As an emetic, employed in the same class of cases as zinc sulphate. It is given in diarrhœa and dysentery, and sometimes as a substitute for arsenic in cutaneous and other affections.

Toxicology. Acute poisoning.—The matters vomited may be of a green tinge and afterwards contain blood; collapse, delirium, coma, convulsions and paralysis. *Treatment.*—Albumin, milk or magnesia; potassium ferrocyanide; empty the stomach and saturate the system with potassium iodide. *Chronic poisoning.*—Anæmia, wasting, dyspepsia, gastro-intestinal catarrh, pharyngeal and laryngeal catarrh with occasional hæmoptysis and aphonia, headache, tremors, vague pains, profuse secretion of sweat, which may be greenish in hue, green discoloration at the upper borders of the teeth. *Treatment.*—Diluted phosphoric acid; large quantities of milk; thorough daily evacuations of the bowels with magnesium or sodium sulphate.

II. ARGENTUM.

Ag = 107.12.

1. ARGENTI NITRAS.—Silver Nitrate. $AgNO_3 = 168.69$. *Synonym.*—Lunar caustic. It should contain not less than 99.9 per cent. of pure Silver Nitrate, and should be kept in dark amber-colored vials, protected from light.

SOURCE.—Dissolve Silver in Nitric Acid with the aid of heat. Evaporate and crystallize. $6HNO_3 + 3Ag_2 = 6AgNO_3 + 3H_2$.

CHARACTERS.—Colorless, transparent, tabular, rhombic crystals, becoming gray or grayish-black on exposure to light in the presence of organic matter; odorless, and having a bitter, caustic and strongly metallic taste. *Solubility.*—In 0.54 part of water and 0.1 part of boiling water; in 24 parts of Alcohol and 5 of boiling Alcohol.

IMPURITIES.—Copper, lead, foreign salts.

INCOMPATIBLES.—Alkalies and their carbonates, chlorides, iodides, sulphates, copper salts, morphine salts, oils, hypophosphites, acids (except nitric and acetic), solutions of arsenic, astringent infusions.

Dose, 0.010 gm. = 10 milligm. ($\frac{1}{6}$ gr.).

Preparations.

1. Argenti Nitras Fusus.—Moulded Silver Nitrate. *Synonym.*—Lunar caustic. It should contain not less than 94.8 per cent. of pure Silver Nitrate.

SOURCE.—By melting Silver Nitrate, 100; Hydrochloric Acid, 4; cooling in moulds.

CHARACTERS.—A white, hard solid, generally in the form of pencils or cones of a fibrous fracture, becoming gray or grayish-black on exposure to light in the presence of organic matter; odorless, and having a bitter, caustic and strongly metallic taste. *Solubility.*—Soluble, with the exception of about 5 per cent. of Silver Chloride (which should be completely soluble in Ammonia Water), in 0.54 part of water and 0.1 part of boiling water; in 24 parts of Alcohol and 5 parts of boiling Alcohol.

2. Argenti Nitras Mitigatus.—Mitigated Silver Nitrate. *Synonym.*—Mitigated caustic. It should contain not less than 33.3 per cent. of pure Silver Nitrate.

SOURCE.—Made by fusing together Silver Nitrate, 30, and Potassium Nitrate, 60. The product is poured into moulds.

CHARACTERS.—A white, hard solid, generally in the form of pencils or cones of a finely granular fracture, becoming gray or grayish-black on exposure to light in the presence of organic matter; odorless, having a caustic, metallic taste, and, in solution, neutral to litmus paper.

2. ARGENTI OXIDUM.—Silver Oxide. $Ag_2O = 230.12$. It should contain 99.8 per cent. of pure Silver Oxide, and should be kept in dark amber-colored vials.

SOURCE.—Shake a solution of Silver Nitrate with a solution of Potassa and wash the precipitate. $2AgNO_3 + 2KOH = Ag_2O + 2KNO_3 + H_2O$.

CHARACTERS.—A heavy, dark, brownish-black powder, having a metallic taste. *Solubility.*—Slightly in water; insoluble in Alcohol; completely soluble in Nitric Acid.

IMPURITIES.—The carbonate and chloride and the impurities of Silver Nitrate.

INCOMPATIBLES.—Antimony and arsenic sulphides, chlorides, bismuth, copper, iron and mercury salts, and organic substances, especially creosote, for it rapidly oxidizes them and forms explosive compounds.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

3. ARGENTI CYANIDUM.—Silver Cyanide. $AgCN = 132.96$. It should contain not less than 99.9 per cent. of pure Silver Cyanide, and should be kept in dark amber-colored vials, protected from light.

SOURCE.—From Potassium Cyanide, which reacts with Silver Nitrate, producing the precipitate of Silver Cyanide. $KCN + AgNO_3 = AgCN + KNO_3$.

CHARACTERS.—A white powder, odorless and tasteless, permanent in dry air, but gradually turning brown on exposure to light. *Solubility.*—Insoluble in water or Alcohol; soluble in Ammonia Water, Sodium Thiosulphate T. S. and Potassium Cyanide T. S., and in boiling Nitric Acid with evolution of Hydrocyanic Acid.

Silver Cyanide is used to prepare extemporaneously Acidum Hydrocyanicum Dilutum.

Unofficial Preparations.

1. Argenti Citras. — Silver Citrate. *Synonym.* — Itrol. $Ag_3C_6H_5O_7$. A fine, light, odorless powder, not readily soluble in water.

2. Argenti Lactas.—Silver Lactate. *Synonym.*—Actol. $AgC_3H_5O_3$. A colorless, odorless and tasteless powder, which coagulates albumin and is soluble in 20 parts of water.

3. Argentum Colloidale.—Colloidal Silver. *Synonyms.*—Soluble Silver. Collargol.

SOURCE.—Obtained by pouring into 100 c.c. of a 10 per cent. Silver Nitrate solution, with stirring, a mixture of 30 gm. Ferrous Sulphate dissolved in 100 c.c. of water and 36 gm. crystallized Sodium Citrate dissolved in 140 c.c. of water. After allowing the precipitate to settle, the supernatant liquid is poured off, the precipitate dissolved in water, and again precipitated with absolute alcohol.

CHARACTERS.—When dried, it is a bluish- or greenish-colored mass, which dissolves in water with a deep red color, but is precipitated from its solution by the addition of salt solutions. It contains 97.2 per cent. of silver.

Dose, .01 gm.; ⅙ gr.

4. Argoninum.—Argonin. *Synonym.*—Silver Caseinate.

SOURCE.—Obtained by mixing a solution of a sodium compound of Casein with Silver Nitrate, and precipitating with alcohol.

CHARACTERS.—A colorless powder, neutral in reaction. *Solubility.*—Readily soluble in warm or albuminous water, with difficulty in cold water.

5. Argyrolum.—Argyrol. *Synonym.*—Silver Vitellin. A compound of derived proteid and Silver Oxide, containing 20 to 25 per cent. of Silver.

SOURCE.—Vitellin, prepared by the electrolytic decomposition of Serum Albumin, is finely suspended in water, moist freshly precipitated Silver Oxide is added, and the mixture heated under pressure until combination occurs. The liquid is then evaporated to dryness *in vacuo.*

CHARACTERS.—Black, glistening, hygroscopic scales. *Solubility.*—Freely in water and in Glycerin; insoluble in oils or Alcohol.

INCOMPATIBLES.—Acids and most neutral and acid salts in strong solution.

Dose, .30 to .60 gm.; 5 to 10 gr.

6. Protargol.—Protargol. A compound consisting of 8.3 per cent. of silver combined with Protein.

CHARACTERS.—A yellow powder, readily soluble in water.

ACTION.

Astringent; hæmostatic; antiseptic; more irritant and corrosive than lead salts. The solid nitrate causes an eschar. Internally, silver salts appear to have no astringent action. Pigmentation of the skin and mucous membranes (argyria) is caused by administration for prolonged periods, and by the long-continued application of silver nitrate to the eye, nose or throat. The nitrate is a gastro-intestinal irritant and corrosive.

USES.

Silver foil is employed as a surgical dressing. The nitrate is in constant use as a superficial caustic. Solutions of this salt

are used in gonorrhœa and gleet, for the prevention of bed-sores, in ophthalmological practice, etc. Various unofficial preparations of silver are also employed for the same purposes. Colloidal silver has been successfully applied by inunction for chronic furunculosis, phlebitis and other septic processes. Silver nitrate is given by the mouth in gastric ulcer, gastritis and diarrhœa, and by injection in dysentery, and ulcerations of the lower bowel. Colloidal silver has been used internally in osteomyelitis, so-called gonorrhœal rheumatism, puerperal fever, cerebro-spinal meningitis, and other diseases.

Toxicology.—Sodium chloride solution; milk; opiates to relieve pain.

III. AURUM.

Au = 195.7.

AURI ET SODII CHLORIDUM.—Gold and Sodium Chloride. A mixture of equal parts by weight of dry Gold Chloride ($AuCl_3 = 301.24$) and anhydrous Sodium Chloride ($NaCl = 58.06$), representing not less than 30 per cent. of metallic Gold. It should be kept in well-stoppered, amber-colored vials.

CHARACTERS.—An orange-yellow powder, odorless, having a saline and metallic taste, and, in solution, a slightly acid reaction. *Solubility.*—Very soluble in water, and at least one-half should be soluble in cold Alcohol.

IMPURITIES.—Free hydrochloric acid, metallic impurities.

INCOMPATIBLES.—Alkalies, arsenites, hypophosphorous and sulphurous acids, ferrous and mercurous salts, potassium iodide, organic substances, and vegetable infusions.

Dose, 0.005 gm. = 5 milligm. ($\frac{1}{12}$ gr.).

ACTION.

Small doses promote appetite and digestion, stimulate the functions of the brain, and have an aphrodisiac effect. Full doses cause nausea and vomiting, and poisoning by larger amounts resembles that by corrosive mercuric chloride.

USES.

Irritative dyspepsia; gastro-intestinal catarrh; ovaritis; hepatic sclerosis; granular kidney; tertiary syphilis.

GROUP III.

The Earth Metals: Aluminum, Cerium.

I. ALUMINUM.

Al = 226.9.

1. **ALUMEN.**—Alum. $AlK(SO_4)_2 + 12H_2O = 471.02$. *Synonym.*—Potassium Alum. It should contain not less than 99.5 per cent. of pure Aluminum and Potassium Sulphate.

SOURCE.—Made from Alum Slate or Shale (a mixture of Aluminum Silicate and Iron Sulphide) by roasting and exposing to the air. By lixiviating the heaps with water, Sulphuric Acid, Aluminum and Iron Sulphates are obtained in solution. This solution is concentrated, and while hot mixed with Potassium Chloride, which, reacting upon the Ferric Sulphate, yields Potassium Sulphate and Ferric Chloride, while the Alum separates on cooling as a crystalline powder. It is then purified by one or two recrystallizations. Also obtained by making an Aluminum Sulphate from Aluminum Hydroxide, a by-product in the manufacture of Sodium Hydroxide from Cryolite.

CHARACTERS.—Large, colorless, octahedral crystals, sometimes modified by cubes, or in crystalline fragments; odorless, and having a sweetish and strongly astringent taste. *Solubility.*—In 9 parts of water and 0.3 part of boiling water; freely in warm Glycerin; insoluble in Alcohol.

IMPURITIES.—Iron, ammonium alum, heavy metals.

INCOMPATIBLES.—Alkalies, carbonates, lime, lead, mercury, and iron salts, magnesia, phosphates, sodium borate, tartrates, tannic acid.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparation.

Alumen Exsiccatum.—Exsiccated Alum. $AlK(SO_4)_2 = 256.46$. *Synonym.*—Burnt Alum. It should contain not less than 99 per cent. of pure anhydrous Aluminum and Potassium Sulphate.

SOURCE.—Heat 100 parts of Alum with moderate heat till aqueous vapor ceases to be disengaged, and it is reduced to 55 parts.

CHARACTERS.—A white, granular powder, without odor, possessing a sweetish, astringent taste, and attracting moisture from the air. *Solubility.*—Slowly but completely soluble in about 17 parts of water, and quickly soluble in 1.4 of boiling water.

2. **ALUMINI HYDROXIDUM.**—Aluminum Hydroxide. $Al(OH)_3 = 77.54$. *Synonym.*—Hydrated Alumina. It should contain not less than 99.5 per cent. of pure Aluminum Hydroxide.

SOURCE.—By separate solution of Alum, 100, and Monohydrated Sodium

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IMPURITI

in water, and heating to boiling. Mix the hot solutions,
pitate with hot water, dry and reduce to a fine powder.
.—A white, light amorphous powder, odorless, tasteless,
t in dry air. *Solubility.*—Insoluble in water or Alcohol,
soluble in Hydrochloric or Sulphuric Acid and in Potassium
.
The sulphate, iron, alkali salts, heavy metals.
Sulphate. $Al_2(SO_4)_3 + 16H_2O$
n 99.5 per cent. of the pure salt.
solved in diluted Sulphuric Acid;
dryness.
vder, or shining plates, or crys-
weetish and afterwards astringent
oluble in Alcohol.
, heavy metals.

Unofficial Preparation.

Alumnol.—Alumnol. *Synonym.*—Aluminum Naphthol-Sulphonate.

CHARACTERS.—An Aluminum Salt of Naphthol-Sulphonic Acid. It occurs as a colorless powder, not hygroscopic, readily soluble in cold water and Glycerin, and slightly soluble in Alcohol. It precipitates Albumin and Gelatin, but the precipitate is soluble in an excess of Ether.

ACTION.

Irritant; antiseptic; astringent; hæmostatic; emetic.

USES.

Alum, in powder, solution, or ointment, is in general use as a local astringent and styptic. It is a good emetic, especially for children. As an internal astringent and hæmostatic it is not as a rule as efficient as some other agents, but in the form of alum whey often serves a useful purpose. Alum is one of the best of all remedies in the treatment of lead colic.

KAOLINUM.—Kaolin. A native Aluminum Silicate, consisting largely of the pure silicate ($H_2Al_2Si_2O_8 + H_2O = 257.12$), powdered and freed from gritty particles by elutriation.

CHARACTERS.—A soft, white or yellowish-white powder, or in lumps, having an earthy or clay-like taste. Insoluble in water or in cold dilute solutions of the acids and alkali hydroxides.

IMPURITIES.—Iron, aluminum hydroxide, impure silica.

Preparation.

Cataplasma Kaolini.—Cataplasm of Kaolin.

Kaolin, 662; Boric Acid, 45; Thymol, 0.5; Methyl Salicylate, 2; Oil of Peppermint, 0.5; Glycerin, 290. Heat the Kaolin in a suitable vessel at 100° C. (212° F.), with occasional stirring, for one hour; mix it intimately with the Boric Acid, and then incorporate the mixture thoroughly with the Glycerin; finally add the Thymol, which has been dissolved in the Methyl Salicylate, and the Oil of Peppermint, and make a homogeneous mass.

Action.

Emollient; desiccant. It has the power in a pronounced degree of clarifying and decolorizing oils.

Uses.

As a dusting powder for inflamed surfaces and irritable conditions of the skin; as a basis for making pills of substances in which chemical reaction would ordinarily take place; with glycerin as a substitute for poultices; for clarifying oils, as well as wine, beer, honey, syrups, etc.

II. CERIUM.

Ce = 139.2.

CERII OXALAS.—Cerium Oxalate. It consists chiefly of a mixture of the oxalates of Cerium, Didymium and Lanthanum, and of other rare earths of this group. Many specimens do not contain more than 60 per cent. of pure Cerium Oxalate.

Source.—The powdered mineral is heated with concentrated Sulphuric Acid, ignited, then dissolved in dilute Nitric Acid and treated with Hydrogen Sulphide to remove copper, etc.; Hydrochloric Acid is added to prevent precipitation of calcium salt, and the cerite metals are precipitated as oxalates by Oxalic Acid. The residue is purified by calcination and solution, reduced to Cerous Sulphate by Sodium Thiosulphate, and the Oxalate precipitated by Oxalic Acid.

Characters.—A fine, white granular powder, without odor or taste. *Solubility.*—Insoluble in water, Alcohol or Ether; soluble in hot diluted Sulphuric or Hydrochloric Acid.

Impurities.—Aluminum, zinc, arsenic, carbonates, heavy metals.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Action.

Very little is known of its action, but, injected into the circulation, it is said to induce gastro-intestinal and renal irritation or inflammation.

Uses.

To control vomiting and cough and in chronic diarrhœa.

GROUP IV.

Lead, Bismuth, Chromium, Manganese.

I. PLUMBUM.

Pb = 205.35.

1. PLUMBI OXIDUM.—Lead Oxide. $PbO = 221.23$. *Synonym.*—Litharge. It should contain not less than 96 per cent. of pure Lead Oxide, and should be kept in well-closed vessels.

Source.—Made by roasting Lead in air.

Characters.—A heavy, yellowish or reddish-yellow powder, or minute scales, without odor or taste. *Solubility.*—Almost insoluble in water, to which, however, it imparts a faintly alkaline reaction; insoluble in Alcohol, but soluble in Acetic or diluted Nitric Acid, and in warm solutions of the fixed alkali hydroxides.

Impurities.—Copper, iron, lead carbonate, silicates, barium sulphate. *Lead Oxide is used to make* Liquor Plumbi Subacetatis.

2. PLUMBI ACETAS.—Lead Acetate. $Pb(C_2H_3O_2)_2 + 3H_2O = 376.15$. *Synonym.*—Sugar of Lead. It should contain not less than 99.5 per cent. of pure Lead Acetate $[(CH_3 \cdot COO)_2Pb + 3H_2O]$, and should be kept in well-stoppered bottles.

Source.—Metallic Lead is dissolved, in the presence of air, in Acetic Acid. $PbO + 2C_2H_4O_2 + 2H_2O = Pb(C_2H_3O_2)_2 + 3H_2O$. To obtain well-defined crystals the solution must have a distinctly acid reaction.

Characters.—Colorless, shining, transparent, monoclinic prisms or plates, or heavy, white, crystalline masses, or granular crystals, having a faintly acetous odor and a sweetish, astringent, afterwards metallic taste. Efflorescent, and absorbing Carbon Dioxide, on exposure to the air. *Solubility.*—In 2 parts of water and 0.5 part of boiling water; in 30 parts of Alcohol and one part of boiling Alcohol.

Impurities.—Lead carbonate, iron, copper, zinc, salts of the alkali metals, and those of magnesium, calcium, zinc and iron.

Incompatibles.—Hard water, mineral acids and salts, alkalies, lime

water, potassium iodide, hydrated chloral, phenol, resorcinol, vegetable astringents, preparations of opium, albuminous liquids.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Preparations.

1. Emplastrum Adhæsivum.—Adhesive Plaster. Rubber, 20; Petrolatum, 20; Lead Plaster, 960.

Adhesive Plaster is contained in Emplastrum Belladonnæ, Capsici and Opii.

2. Emplastrum Plumbi.—Lead Plaster. *Synonym.*—Diachylon Plaster. Lead Acetate, 60, is dissolved in hot water, 250, and the solution filtered, with constant stirring, into a solution of Soap, 100, in hot water, 350. When the precipitate has subsided, the liquid is decanted and the precipitate washed thoroughly with hot water. Transfer the mass to a warm slab, kneading it thoroughly to keep it free from water; finally roll the plaster into cylindrical forms and wrap them in paraffined paper.

3. Unguentum Diachylon.—Diachylon Ointment. Lead Plaster, 50; Oil of Lavender Flowers, 1; Olive Oil, 49.

Lead Plaster is contained also in Emplastrum Hydrargyri and Saponis.

Preparations made from the Acetate in which Lead exists as the **SUBACETATE,** approximately $Pb_2O(C_2H_3O_2)_2 = 543.74$.

1. Ceratum Plumbi Subacetatis.—Cerate of Lead Subacetate. *Synonym.*—Goulard's Cerate. Solution of Lead Subacetate, 20; Wool-Fat, 20; Paraffin, 20; White Petrolatum, 38; Camphor, 2.

2. Liquor Plumbi Subacetatis.—Solution of Lead Subacetate. *Synonym.*—Goulard's Extract. Lead Acetate, 180, and Lead Oxide, 110, are boiled together in distilled water, to make 1000. An aqueous liquid, which should contain in solution not less than 25 per cent. of Lead Subacetate.

3. Liquor Plumbi Subacetatis Dilutus.—Diluted Solution of Lead Subacetate. *Synonym.*—Lead Water. Liquor Plumbi Subacetatis, 40; distilled water to 1000. It should contain about 1 per cent. of Lead Subacetate.

3. PLUMBI NITRAS.—Lead Nitrate. $Pb(NO_3)_2 = 328.49$. It should contain not less than 99.5 per cent. of pure Lead Nitrate $[(NO_2 \cdot O)_2Pb]$, and should be kept in well-closed vessels.

SOURCE.—Obtained by nearly neutralizing warm dilute Nitric Acid with Lead Oxide, and crystallizing in a cool place.

CHARACTERS.—Colorless, transparent, octahedral crystals, or white, nearly opaque crystals; without odor, and having a sweetish, astringent, afterwards metallic taste. *Solubility.*—In 1.85 parts of water and in 0.75 part of boiling water; almost insoluble in Alcohol.

IMPURITIES.—The same as those of the Acetate.

Ledoyen's Disinfecting Fluid is Lead Nitrate, 1; dissolved in water, 8 parts.

4. PLUMBI IODIDUM.—Lead Iodide. $PbI_2 = 457.15$. It should contain not less than 99 per cent. of pure Lead Iodide, and should be kept in well-stoppered bottles, protected from light.

SOURCE.—Mix solutions of Lead Nitrate and Potassium Iodide and dry the precipitate. $Pb(NO_3)_2 + 2KI = 2KNO_3 + PbI_2$.

CHARACTERS.—A heavy, bright yellow powder, without odor or taste. *Solubility.*—In about 1300 parts of water and about 200 parts of boiling water; soluble in solutions of the fixed alkalies, concentrated solutions of the alkali acetates, Potassium Iodide, and Sodium Thiosulphate, and in a hot solution of Ammonium Chloride; very slightly in Alcohol.

IMPURITIES.—Lead acetate and nitrate, soluble foreign salts.

ACTION.

Externally, lead salts are astringent and sedative; internally they act as astringents and in large doses as gastro-intestinal irritants. Lead is excreted in the intestinal secretions, urine, bile, saliva and milk, and probably by the glands of the skin. Chronic lead-poisoning is characterized by constipation, anæmia, intestinal colic, muscular paralysis from neuritis, especially wrist-drop or "painter's palsy," a dark line at the base of the teeth, known as Burton's line, arthralgia, and nephritis, and sometimes by cerebral lesions, amblyopia, and degenerative changes in the anterior columns of the spinal cord.

USES.

Lead salts, in the form of lotions and ointments, are employed in a great variety of local inflammations, as well as many skin diseases, and lead iodide ointment is a useful resolvent. Lead plaster is excellent for preventing bed-sores and as a basis for other plasters, and is used by surgeons to protect parts of the body exposed to chafing by splints or other apparatus. Internally, lead acetate is given for hæmoptysis, hæmatemesis, gastric catarrh, and

intestinal disorders, and is also employed by enema and suppository for rectal hæmorrhage and dysentery.

Toxicology. Acute poisoning.—Give emetics or wash out the stomach; sodium or magnesium sulphate; stimulants and warmth to combat collapse. *Chronic poisoning.*—Potassium iodide, saline purgatives, diuretics and hot baths, for promoting elimination, and general measures to improve the nutrition and strength. For the various effects of lead in the system special treatment is required, as alum or opiates to relieve the colic or arthralgia, and strychnine, electricity and massage for the paralysis.

II. BISMUTHUM.

Bi = 206.9.

1. **BISMUTHI SUBCARBONAS.**—Bismuth Subcarbonate, approximately $(BiO)_2, CO_3 = 505.11$. It should yield not less than 90 per cent. of pure Bismuth Oxide.

SOURCE.—Dissolve Purified Bismuth in Nitric Acid and water, decant and filter, mix with Ammonia Water; the precipitate is washed and dissolved in Nitric Acid, and poured into a solution of Sodium Carbonate, the resulting precipitate is collected and washed. The final reaction is $2Bi(NO_3)_3 + 3Na_2CO_3 + H_2O = (BiO)_2, CO_3 + H_2O + 6NaNO_3 + 2CO_2$. The precipitated Carbonate is separated by filtration.

CHARACTERS.—A white or pale yellowish-white powder, of somewhat varying chemical composition, odorless and tasteless. *Solubility.*—Insoluble in water or Alcohol, but completely soluble in Nitric or Hydrochloric Acid, with copious efflorescence.

IMPURITIES.—Lead, arsenic, copper, silver, the sulphate and subnitrate, chlorides, alkalies, alkaline earths, and tellurium, the last giving an alliaceous odor to the breath.

INCOMPATIBLES.—Acids, alkaloidal salts, bismuth subnitrate, aluminum, barium, calcium, copper, iron, lead, manganese, silver, strontium and zinc salts, urethane.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

2. **BISMUTHI SUBNITRAS.**—Bismuth Subnitrate, approximately $Bi(OH)_2NO_3 = 302.23$. It should yield not less than 80 per cent. of pure Bismuth Oxide.

SOURCE.—Dissolve Purified Bismuth in Nitric Acid and water, concentrate by evaporation, pour in more water, and stir thoroughly, wash and dry the precipitated Subnitrate. $Bi_2 + 6HNO_3 = 2Bi(NO_3)_3 + 3H_2$ and $Bi(HO_3)_3 + H_2O = BiONO_3 + 2HNO_3$.

CHARACTERS.—A white powder, of somewhat varying chemical com-

position, odorless and almost tasteless. *Solubility.*—Almost insoluble in water and insoluble in Alcohol; readily in Nitric or Hydrochloric Acid.

IMPURITIES.—As of the subcarbonate.

INCOMPATIBLES.—Alkali carbonates and hydroxides, calomel, hypophosphites, iodides, sulphur, salicylic, tannic and gallic acids.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Bismuth subnitrate is used to prepare Neylander's test for glucose in urine.

3. BISMUTHI CITRAS.—Bismuth Citrate. $BiC_6H_5O_7 = 394.52$. It should yield not less than 56, nor more than 58, per cent. of pure Bismuth Oxide.

SOURCE.—Boil Bismuth Subnitrate, 100, in Citric Acid, 75, dissolved in sufficient distilled water. Wash the precipitate and dry. $BiONO_3 + H_3C_6H_5O_7 + H_2O = BiC_6H_5O_7 + NO_4 + H_2O$.

CHARACTERS.—A white, amorphous or micro-crystalline powder, odorless and tasteless. *Solubility.*—Insoluble in water or Alcohol; soluble in Ammonia Water and in solutions of alkali citrates.

IMPURITIES.—As of the subcarbonate.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

Preparation.

Bismuthi et Ammonii Citras.—Bismuth and Ammonium Citrate. *Synonym.*—Bismuth Ammonio-Citrate.

SOURCE.—Mix Bismuth Citrate, 100, with distilled water to make a paste, heat, add Ammonia Water to make a solution; filter, evaporate, and dry on plates of glass.

CHARACTERS.—Shining, pearly or translucent scales, odorless, and having a metallic taste. *Solubility.*—Very soluble in water; sparingly soluble in Alcohol.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

4. BISMUTHI SUBGALLAS.—Bismuth Subgallate, approximately $Bi(OH)_2C_7H_5O_5 = 408.43$. *Synonym.*—Dermatol. It should yield not less than 52, nor more than 57, per cent. of pure Bismuth Oxide.

SOURCE.—Normal Bismuth Nitrate is dissolved in Glacial Acetic Acid and water is added; with this is mixed a solution of Gallic Acid in warm water. Then allow the precipitate to subside; decant; wash by decantation with warm water until the washings no longer show an acid reaction; dry at 100° C. (212° F.), and rub to powder.

CHARACTERS.—An amorphous, bright yellow powder, somewhat variable in chemical composition, and without odor or taste. *Solubility.*—Insoluble in water, Alcohol or Ether; readily soluble, with decomposition, in Hydrochloric, Nitric and Sulphuric Acids, if these be heated; also soluble in solutions of the alkali hydroxides.

IMPURITIES.—Free gallic acid and the nitrate. Other impurities as of the subcarbonate.

INCOMPATIBLES.—Acids.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

5. BISMUTHI SUBSALICYLAS.—Bismuth Subsalicylate, approximately $Bi(OH)_2C_7H_5O_3 = 376.67$. It should yield not less than 62, nor more than 66, per cent. of pure Bismuth Oxide.

SOURCE.—It is prepared by diluting a Glycerin solution of crystallized Bismuthous Nitrate with water, and decomposing this with a concentrated aqueous solution of Sodium Salicylate; the precipitate is well washed with hot water and carefully dried.

CHARACTERS.—A white, or nearly white, amorphous or crystalline powder, odorless and tasteless. *Solubility.*—Almost insoluble in cold water; upon prolonged boiling with water a portion of the Salicylic Acid passes into solution, with the formation of a more basic Bismuth Salicylate.

IMPURITIES.—Nitrates, free salicylic acid. Other impurities as of the subcarbonate.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Unofficial Preparations.

1. Bismuthi Naphtholas.—Bismuth Naphtholate. *Synonyms.*—Betanaphthol Bismuth. Orphol. $(C_{10}H_2O)_3Bi + 3H_2O$. A neutral, light brown, non-irritant powder, nearly odorless and tasteless, and insoluble in water.

Dose, .30 to 2.00 gm.; 5 to 20 gr.

2. Bismuthi Phenolas.—Bismuth Phenolate. $Bi(OH)_2(C_6H_5O)$. *Synonyms.*—Phenol-Bismuth. Bismuth Carbolate. A white, neutral powder, almost odorless and tasteless, and containing, it is asserted, 80 per cent. of Bismuth in chemical combination with 19 per cent. of Phenol.

Dose, 0.5 to 2 gm.; 7½ to 30 gr.

3. Bismuthi Tribromophenolas.—Bismuthi Tribromophenolate. $(C_6H_2Br_3O)_2BiOH + Bi_2O_3$. *Synonym.*—Xeroform. A yellowish-green, insoluble, nearly odorless and tasteless powder, said to be a chemical combination of equal amounts of Bismuth and Tribromophenol, and containing about 50 per cent. of Bismuth Oxide.

Dose, 0.5 to 1 gm.; 8 to 15 gr.

ACTION.

On abraded surfaces bismuth salts are antiseptic and mildly astringent, but it is possible for a sufficient quantity of bismuth

to be absorbed to induce toxic symptoms, such as acute stomatitis, with ulceration and a peculiar blackish discoloration of the mucous membrane, nausea, vomiting, diarrhœa and albuminuria. Taken by the mouth they cause more or less constipation and blacken the stools, and also have some antiseptic effect.

Uses.

Bismuth salts, as dusting powders and in ointments, are used for excoriated surfaces, wounds, etc., and in the treatment of skin diseases. The subnitrate, snuffed into the nostrils, is employed in coryza and simple ozæna and as a topical application in aphthous or nursing sore mouth, mercurial ptyalism, chronic conjunctivitis and granular lids, and ulcers of the rectum. Internally bismuth salts are useful in gastralgia, vomiting, gastritis and diarrhœa, and as intestinal antiseptics.

III. CHROMIUM.

Cr. = 51.7.

1. **CHROMII TRIOXIDUM.**—Chromium Trioxide. $CrO_3 = 99.34$. *Synonyms.*—Chromic Acid. It should contain not less than 90 per cent. of pure Chromium Trioxide (Chromic Acid Anhydride). It should be kept in glass-stoppered bottles, and, on account of the danger of accident, great caution should be observed to avoid bringing it in contact with organic substances, such as Cork, Tannic Acid, Sugar, Alcohol and Collodion.

Source.—Dissolve Potassium Dichromate in Sulphuric Acid and water, decant from the Acid Potassium Sulphate, heat with more Sulphuric Acid, cool and crystallize. $K_2Cr_2O_7 + 2H_2SO_4 = 2CrO_3 + 2KHSO_4 + H_2O$.

Characters.—Small, needle-shaped crystals, or rhombic prisms, of a dark purplish-red color and metallic lustre. *Solubility.*—Very soluble in water. When it is brought in contact with Alcohol, Ether, Glycerin and other organic solvents, decomposition takes place, sometimes with dangerous violence.

Impurity.—Sulphuric Acid.

Action.

Deodorant, disinfectant and powerfully caustic; taken internally, it causes intense pain, vomiting and purging, with blood in the vomited matter and stools, collapse, and frequently death.

Uses.

Strong solutions are employed to destroy growths of various kinds, and weaker ones in the local treatment of foul sores and ulcers, parasitic skin diseases, gonorrhœa, ozæna, uterine hæmorrhage, endo-cervicitis, hæmorrhoids, etc.

2. POTASSII DICHROMAS.—Potassium Dichromate. $K_2Cr_2O_7 = 292.28$. It should contain not less than 99 per cent. of pure Potassium Dichromate [$Cr_2O(OK)_2$], and should be kept in well-stoppered bottles.

Source.—Finely-ground Chrome-iron ore mixed with Potassium Carbonate is roasted in a reverberatory furnace, which causes the separation of all iron in the form of Ferric Oxide, and the production of Potassium Bichromate. Lime or chalk is added during the roasting to prevent fusion. $2FeOCr_2O_3 + 4K_2CO_3 + 4O_2 = Fe_2O_3 + 4K_2CrO_4 + 4CO_2$. After solution in water Sulphuric Acid is added, and the two salts are separated by crystallization. $2K_2CrO_4 + H_2SO_4 = K_2Cr_2O_7 + K_2SO_4 + H_2O$.

Characters.—Large, orange-red, transparent, triclinic prisms, or four-sided tabular crystals, odorless, and having an acidulous, metallic taste. *Solubility.*—In about 9 parts of water and 1.5 parts of boiling water; insoluble in Alcohol. Oxidizing readily, it is apt to form explosive compounds.

Impurities.—Sulphates, chlorides, calcium.

Dose, 0.010 gm. = 10 milligm. ($\frac{1}{6}$ gr.).

Action.

Caustic and antiseptic, but somewhat less energetic than chromium trioxide; in moderate doses, emetic.

Uses.

External: Warts, venereal ulcers, mucous patches; sloughing wounds. Internal: Gastric catarrh; gastric ulcer; hæmatochyluria; catarrhal conditions of the respiratory tract.

IV. MANGANUM.

Mn = 54.6.

1. MANGANI DIOXIDUM PRÆCIPITATUM.—Precipitated Manganese Dioxide. Chiefly Manganese Dioxide ($MnO_2 = 86.36$), with small amounts of other manganese oxides, corresponding to not less than 80 per cent. of Manganese Dioxide.

Source.—Manganese Sulphate, 50, is dissolved in distilled water, 1000. Ammonia Water, 250, is diluted with an equal volume of distilled water, and

mixed with solution of Hydrogen Dioxide, 250, which has also been diluted with an equal volume of distilled water, and the mixed solutions are slowly poured, with constant stirring, into the solution of Manganese Sulphate. Allow the mixture to stand for one hour, stirring frequently; then decant the supernatant clear liquid from the precipitate, and wash the latter repeatedly by affusion and decantation with hot distilled water. Collect the precipitate on a plain filter, and continue the washing until the washings no longer have an alkaline reaction and produce no turbidity when mixed with Barium Chloride test solution. Allow the precipitate to drain; then dry it at 150° C. (302° F.).

CHARACTERS.—A heavy, very fine, black powder, without odor or taste. Insoluble in water or Alcohol.

IMPURITIES.—Antimony sulphide, insoluble substances.

INCOMPATIBLES.—Alkalies, carbonates, cyanides and phosphates. The same incompatibles apply to other Manganese salts.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Manganese Dioxide is used for making Corrosive Mercuric Chloride and Potassium Permanganate.

2. MANGANI SULPHAS.—Manganese Sulphate. $MnSO_4 + 4H_2O = 221.47$. It should contain not less than 99.5 per cent. of pure Manganese Sulphate ($SO_2 \cdot O_2Mn + 4H_2O$), and should be kept in well-stoppered bottles.

SOURCE.—By heating Manganese Dioxide with sufficiently strong Sulphuric Acid, evaporation and crystallization.

CHARACTERS.—Colorless, or pale rose-colored, translucent tetragonal prisms, containing 4 molecules, or 32.29 per cent., of water of crystallization, and having a slightly bitter and astringent taste. *Solubility.*—In about 0.7 part of water and 0.53 part of boiling water; insoluble in Alcohol.

IMPURITIES.—Zinc, iron, magnesium, heavy metals, salts of the alkalies, manganese sulphate containing a larger amount of water of crystallization.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

ACTION.

In small doses slightly astringent; larger amounts cause vomiting and purging.

USES.

Manganese dioxide is used empirically with success as an emmenagogue. The sulphate has been employed as a cholagogue cathartic, but on account of its irritant properties is a very unsafe remedy.

3. POTASSII PERMANGANAS.—Potassium Permanganate. $KMnO_4 = 156.98$. It should contain not less than 99 per cent. of pure Potassium Permanganate ($MnO_3 \cdot OK$), and should be kept in glass-stoppered bottles, protected from light.

SOURCE.—Caustic Potash, Potassium Chlorate and Manganese Dioxide are heated together. $6KOH + KClO_3 + 3MnO_2 = 3K_2MnO_4 + KCl + 3H_2O$. Potassium Manganate is boiled with water till the color changes to purple and the Permanganate is formed. $3K_2MnO_4 + 2H_2O = 2KMnO_4 + 4KOH + MnO_2$. The liquid is neutralized with Carbon Dioxide and evaporated.

CHARACTERS.—Slender, monoclinic prisms, of a dark purple color, almost opaque by transmitted, and of a blue, metallic lustre by reflected light, odorless, and having a taste at first sweet, but afterwards disagreeable and astringent. *Solubility.*—In about 15 parts of water and in 3 parts of boiling water; a grain (.06 gm.) gives a fine purple color to a gallon of water (3775 c.c.). In contact with Alcohol it is decomposed.

IMPURITIES.—Potassium sulphate, nitrate and chloride.

INCOMPATIBLES.—It is very readily deoxidized in the presence of organic matter. It is usually given as a pill or a tabella, and should be made up with kaolin or paraffin, or an explosion will very likely take place.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

ACTION.

Irritant; disinfectant; deodorant; taken internally in sufficient amount, it causes gastro-enteritis and renal irritation or inflammation.

USES.

In solution, as an application for sores, ulcers and wounds and for various conditions attended with fetor, as an injection for gonorrhœa and gleet, and for washing out the stomach, bladder, uterus, abscess cavities, etc. It is recommended for local use in snake-bites and erysipelas, and as a deodorizer for sputa, stools, drains, etc., and a disinfectant for the hands. Internally, for obesity, especially when attended with dyspepsia and flatulence, lithæmic conditions, acute rheumatism, snake-bite, erysipelas and septicæmia, and as an antidote to morphine poisoning.

4. MANGANI HYPOPHOSPHIS.—*See* Phosphorus.

GROUP V.

Iron.

FERRUM.

Fe = 55.5.

1. **FERRUM.**—Metallic Iron, in the form of fine, bright and non-elastic wire.

Metallic Iron is pharmacopœial in two forms, viz., this and reduced iron.

Metallic Iron is used to prepare Liquor Ferri Chloridi, and Syrupus Ferri Iodidi.

2. **FERRUM REDUCTUM.**—Reduced Iron. *Synonyms.*—Quevenne's Iron. Iron by Hydrogen. It should contain not less than 90 per cent. of pure Metallic Iron.

SOURCE.—Hydrogen gas is passed through a hot, closed tube which contains freshly prepared, thoroughly washed Ferric Oxide. $Fe_2O_3 + 3H_2 = Fe_2 + 3H_2O$.

CHARACTERS.—A very fine, grayish-black, lustreless powder, without odor or taste. Insoluble in water or Alcohol.

IMPURITY.—Arsenic.

INCOMPATIBLES.—Oxidizers, such as hydrogen dioxide, and potassium chlorate and permanganate; salts of antimony, bismuth, copper, lead, mercury and silver.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Reduced Iron is used to make Pilulæ Ferri Iodidi.

The following (viz., the Sulphate, the Carbonate, and the Iodide), *are ferrous salts*, that is to say, salts of the lower Oxide, FeO.

3. **FERRI SULPHAS.**—Ferrous Sulphate. $FeSO_4 + 7H_2O = 276.01$. *Synonyms.*—If impure, Copperas. Green Vitriol. It should contain not less than 99.5 per cent. of pure Ferrous Sulphate ($SO \cdot O_2Fe + 7H_2O$); the crystals should not be effloresced, and should be kept in well-stoppered bottles.

SOURCE.—Iron Wire is dissolved by boiling in Sulphuric Acid and water. The sulphate is crystallized out. $Fe_2 + 2H_2SO_4 = 2FeSO_4 + 2H_2$.

CHARACTERS.—Large, pale, bluish-green, monoclinic prisms, without odor, and having a saline, styptic taste; efflorescent in dry air. On exposure to moist air the crystals readily oxidize, and become coated with brownish-yellow, basic Ferric Sulphate. *Solubility.*—In 1.9 parts of water and in 0.3 part of boiling water; insoluble in Alcohol.

IMPURITIES.—Free acid, alkali metals, heavy metals.

INCOMPATIBLES.—(The same apply to other Ferrous Salts.) Alkalies,

carbonates, chromates, ferricyanides, gold, silver and mercuric salts, hydrogen dioxide, permanganates, sulphides, tannic acid.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

Ferrous Sulphate is used to make Ferri Carbonas Saccharatus, Liquor Ferri Subsulphatis, Liquor Ferri Tersulphatis, and Massa Ferri Carbonatis.

Preparations.

1. **Ferri Sulphas Exsiccatus.**—Exsiccated Ferrous Sulphate.

SOURCE.—Allow the sulphate to effloresce at 40° C. (104° F.) and heat in a porcelain dish until it weighs 64 to 65 parts; then reduce to a fine powder.

CHARACTERS.—A grayish-white powder, slowly but completely soluble in water.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

Exsiccated Ferrous Sulphate is used to make Pilulæ Aloes et Ferri.

2. **Ferri Sulphas Granulatus.**—Granulated Ferrous Sulphate. $FeSO_4 + 7H_2O = 276.01$.

SOURCE.—Dissolve Ferrous Sulphate, 100; in diluted Sulphuric Acid, 5; and Distilled Water, 100; pour upon it Alcohol, 25; and filter, wash and dry the precipitate.

CHARACTERS.—A very pale bluish-green, crystalline powder.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

3. **Mistura Ferri Composita.**—Compound Iron Mixture.

Synonym.—Griffith's Mixture. Ferrous Sulphate, 6; Potassium Carbonate, 8; Myrrh, 18; Sugar, 18; Spirit of Lavender, 60; Rose Water to 1000. It is a dark-green mixture containing Ferrous Carbonate, for Ferrous Sulphate and Potassium Carbonate react on each other.

Dose, 16 c.c. (4 fl. dr.).

4. **Pilulæ Ferri Carbonatis.**—Pills of Ferrous Carbonate.

Synonyms.—Ferruginous pills. Chalybeate pills. Blaud's pills. Ferrous Sulphate, 16; Potassium Carbonate, 8; Sugar, 4; Tragacanth, 1; Althæa, 1 gm.; Glycerin and water; to make 100 pills.

Dose, 2 pills.

4. **FERRI CARBONAS SACCHARATUS.**—Saccharated Ferrous Carbonate. It should contain not less than 15 per cent. of Ferrous Carbonate ($FeCO_3 = 115.05$), and should be kept in small, well-stoppered bottles.

SOURCE.—Made from Ferrous Sulphate, 50; Sodium Bicarbonate, 35; Sugar and distilled water; by solution and filtration.

CHARACTERS.—A greenish-brown powder, gradually becoming oxidized

by contact with air, without odor, and having at first, a sweetish, afterwards a slightly ferruginous taste. *Solubility.*—Only partially in water, but completely upon the addition of Hydrochloric Acid.

IMPURITY.—Ferrous sulphate.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

5. MASSA FERRI CARBONATIS.—Mass of Ferrous Carbonate. *Synonym.*—Vallet's Mass. Ferrous Sulphate, 100; Monohydrated Sodium Carbonate, 46; Clarified Honey, 38; Sugar, 25; Syrup and distilled water to 100. By solution, precipitation and evaporation.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

6. SYRUPUS FERRI IODIDI.—Syrup of Ferrous Iodide. A syrupy liquid, containing about 5 per cent. by weight of Ferrous Iodide (FeI_2 = 307.30), or about 6.74 gm. in 100 c.c. Iron Wire, 12.5; Iodine, 41.5; Diluted Hypophosphorous Acid, 20; Syrup and distilled water, a sufficient quantity to 1000.

CHARACTERS.—A transparent, pale green or yellowish-green liquid, having a sweet, strongly ferruginous taste and an acid reaction. It is unstable. Sp. gr. about 1.349.

IMPURITY.—Free iodine.

Dose, 1 c.c.; 15 ♏.

7. PILULÆ FERRI IODIDI.—Pills of Ferrous Iodide. Triturate Reduced Iron, 4, with Iodine 5, and water; add Glycyrrhiza 1, Sugar 4, Extract of Glycyrrhiza 1, and Acacia 1 gm., with sufficient water, Balsam of Tolu and Ether, and evaporate to make 100 pills. To be preserved from light and air as much as possible, as they do not keep well.

Dose, 2 pills.

The following (viz., the Chloride, the Tersulphate, the Subsulphate, the Hydroxide, the Ammonium Sulphate, the Hypophosphite, and the Valerate) *are Ferric Salts:* they are compounds of the higher Oxide, Fe_2O_3. Most are official in the form of liquors.

8. FERRI CHLORIDUM.—Ferric Chloride. It should contain not less than 22 per cent. of metallic Iron in the form of Chloride, $FeCl_3 + 6H_2O = 268.32$.

SOURCE.—Solution of Ferric Chloride, 100, is evaporated on a water-bath until it has lost half its weight; it is then set aside in a glass-covered vessel until it forms a crystalline mass. Lastly the salt is broken into pieces.

CHARACTERS.—Orange-yellow, crystalline pieces, odorless, or having a faint odor of Hydrochloric Acid, and a strongly styptic taste. Very deliquescent in moist air. *Solubility.*—Freely in water or Alcohol; also in a mixture of 1 part of Ether and 3 parts of Alcohol.

IMPURITIES.—The oxychloride, ferrous salt, nitric acid, heavy metals.

INCOMPATIBLES.—(The same apply to other Ferric Salts.) Acacia, albu-

min, alkalies, apomorphine, aloin, hydriodic, gallic and tannic acids, guaiacol, hypophosphites, iodides, guaiac, oils of cloves, cinnamon, pimenta, thyme and wintergreen, morphine, resorcinol, salicylates, sulphides, sulphites and thiosulphates, vegetable decoctions and infusions.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

9. LIQUOR FERRI CHLORIDI.—Solution of Ferric Chloride. An aqueous solution of Ferric Chloride, which should contain not less than 29 per cent. of the anhydrous salt ($FeCl_3 = 161.04$), corresponding to 10 per cent. of Metallic Iron.

SOURCE.—Dissolve Iron Wire, 125, in Hydrochloric Acid, 680, and water to 1000. $Fe_2 + 4HCl = 2FeCl_2 + 2H_2$. Nitric Acid is also added, and thus the Ferrous is converted into Ferric Chloride. $6FeCl_2 + 6HCl + 2HNO_3 = 3Fe_2Cl_6 + 4H_2O + 2NO$.

CHARACTERS.—A reddish-brown liquid, having a faint odor of Hydrochloric Acid, an acid, strongly styptic taste, and an acid reaction. Sp. gr. about 1.280 to 1.290.

IMPURITIES.—Ferrous salts, the oxychloride, nitric acid, zinc, copper, salts of the fixed alkalies.

Dose, 0.1 c.c. (1½ ♏).

Preparations.

1. Liquor Ferri et Ammonii Acetatis.—Solution of Iron and Ammonium Acetate. *Synonym.*—Basham's Mixture. Tincture of Ferric Chloride, 40; Diluted Acetic Acid, 60; Solution of Ammonium Acetate, 500; Aromatic Elixir, 120; Glycerin, 120; water to 1000.

Dose, 16 c.c. (4 fl. dr.).

2. Tinctura Ferri Chloridi.—Tincture of Ferric Chloride. A hydro-alcoholic solution of Ferric Chloride ($FeCl_3 = 161.04$) containing not less than 13.28 per cent. of the anhydrous salt, corresponding to 4.6 (4.58) per cent. of Metallic Iron Solution of Ferric Chloride, 350; Alcohol to 1000.

CHARACTERS.—A bright, brownish liquid, having a slightly ethereal odor, a very astringent, styptic taste, and an acid reaction. Sp. gr. about 1.005.

IMPURITY.—Nitric acid.

Dose, 0.5 c.c.; 8 ♏.

10. LIQUOR FERRI TERSULPHATIS.—Solution of Ferric Sulphate. An aqueous solution, which should contain about 36 per cent. of normal Ferric Sulphate [$Fe_2(SO_2 \cdot O_2)_3 = 397.05$], corresponding to not less than 10 per cent. of Metallic Iron.

SOURCE.—A hot solution of Ferrous Sulphate, 500, in Sulphuric Acid,

96, and water, is boiled with Nitric Acid and water to 1000. $6FeSO_4 + 3H_2SO_4 + 2HNO_3 = 3Fe_2(SO_4)_3 + 4H_2O + 2NO$.

CHARACTERS.—A dark reddish-brown liquid, almost odorless, and having an acid, strongly styptic taste, and an acid reaction. Sp. gr. from 1.430 to 1.450.

IMPURITIES.—The subsulphate, ferrous salt, nitric acid.

11. LIQUOR FERRI SUBSULPHATIS.—Solution of Ferric Subsulphate. *Synonym.*—Monsel's solution. An aqueous solution of variable chemical composition, containing an amount of basic Ferric Sulphate corresponding to not less than 13.57 per cent. of Metallic Iron.

SOURCE.—From Ferrous Sulphate, 675; Sulphuric Acid, 65; Nitric Acid, a sufficient quantity. Boil and add distilled water to 1000.

CHARACTERS.—A dark reddish-brown liquid, odorless, or nearly so, and having an acid, strongly styptic taste, and an acid reaction. Sp. gr. about 1.548.

IMPURITIES.—The tersulphate, ferrous salt, nitric acid.

Dose, 0.2 c.c. (3 ♏).

12. FERRI HYDROXIDUM.—Ferric Hydroxide. $Fe(OH)_3 = 106.14$.

SOURCE.—Add to a solution of Ferric Sulphate, 100, Ammonia Water, 138. The precipitate is Ferric Hydrate.

CHARACTERS.—A reddish-brown magma, wholly soluble in Hydrochloric Acid without effervescence.

13. FERRI HYDROXIDUM CUM MAGNESII OXIDO.—Ferric Hydroxide with Magnesium Oxide. *Synonym.*—Arsenic Antidote. Mix solution of Ferric Sulphate, 40, with water, 125, and keep the liquid in a large, well-stoppered bottle. Rub Magnesium Oxide, 10, with cold water to a smooth and thin mixture, transfer this to a bottle capable of holding about 1000 c.c., and fill it with water to about three-fourths of its capacity. When the preparation is wanted for use, shake the Magnesium Oxide mixture to a homogeneous, thin magma, add it gradually to the diluted Solution of Ferric Sulphate, and shake them together until a uniform, smooth mixture results.

For the rapid preparation of this antidote to arsenical poisoning, the diluted Solution of Ferric Sulphate and the mixture of Magnesium Oxide with water, should always be kept on hand, in separate bottles, ready for immediate use.

Dose (arsenical antidote), **120 c.c. (4 fl. oz.).**

14. FERRI ET AMMONII SULPHAS.—Ferric Ammonium Sulphate. $FeNH_4(SO_4)_2 + 12H_2O = 478.69$. It should contain, in the uneffloresced condition, 99.5 per cent. of pure Ferric Ammonium Sulphate, and not less than 11.5 per cent. of Metallic Iron. It should be kept in well-stoppered bottles, protected from light.

SOURCE.—From crystallization of Ammonium Sulphate in a solution of Ferric Sulphate.

CHARACTERS.—Pale, violet, octahedral crystals, without odor, and having an acid, styptic taste. Efflorescent on exposure to the air. *Solubility.*—In 2.7 parts of water and in 0.8 part of boiling water; insoluble in Alcohol.

IMPURITIES.—Aluminum, chlorides.

Dose, 0.500 gm.=500 milligm. (7½ gr.).

15. FERRI HYPOPHOSPHIS. *See* Phosphorus.

The following are scale preparations of Iron, so called because they are dried to form scales. They are not well-defined chemical compounds. There are nine—the Soluble Phosphate, Iron and Potassium Tartrate, Iron and Ammonium Citrate, Iron and Strychnine Citrate, Iron and Ammonium Tartrate, the Citrate, Iron and Quinine Citrate, the soluble Iron and Quinine Citrate, the soluble Pyrophosphate.

16. FERRI PHOSPHAS SOLUBILIS.—Soluble Ferric Phosphate. It should contain Ferric Phosphate corresponding in amount to not less than 12 per cent. of Metallic Iron; and should be kept in amber-colored, well-stoppered bottles, protected from light.

SOURCE.—Dissolve Ferric Citrate, 50; in distilled water, 100; add Sodium Phosphate, 55. Evaporate and dry on glass.

CHARACTERS.—Thin, bright green, transparent scales, having an acidulous, slightly saline taste. *Solubility.*—Freely and completely in water; insoluble in Alcohol.

Dose, 0.250 gm.=250 milligm. (4 gr.).

Preparations.

1. Elixir Ferri, Quininæ et Strychninæ Phosphatum.—Elixir of the Phosphates of Iron, Quinine and Strychnine. Soluble Ferric Phosphate, 17.500; Quinine, 8.750; Strychnine, 0.275; Phosphoric Acid, 2.000; Ammonium Carbonate, 9.000; Alcohol, 60.000; Acetic Acid, 28.650; Distilled Water and Aromatic Elixir, to 1000.

Dose, 4 c.c. (1 fl. dr.).

2. Glyceritum Ferri, Quininæ et Strychninæ Phosphatum.—Glycerite of the Phosphates of Iron, Quinine and Strychnine. Soluble Ferric Phosphate, 80; Quinine, 104; Strychnine, 0.8; Phosphoric Acid, 200; Glycerin, 500; Water, to 1000.

Dose, 1 c.c. (15 ♏).

3. Syrupus Ferri, Quininæ et Strychninæ Phosphatum.—Syrup of the Phosphates of Iron, Quinine and Strychnine. *Synonyms.*—Easton's Syrup. Syrupus Trium Phosphatum. Glycerite of the Phosphates of Iron, Quinine and Strychnine, 250; Syrup, to 1000.

Dose, 4 c.c. (1 fl. dr.).

17. FERRI ET POTASSII TARTRAS.—Iron and Potassium Tartrate. *Synonym.*—Tartrated Iron. It should contain Iron and Potassium Tartrate corresponding in amount to not less than 15 per cent. of Metallic Iron. Like the other scale preparations, it should be kept in well-stoppered bottles, protected from light.

SOURCE.—Add solution of Ferric Sulphate, 100; in water, 1300; to Ammonia Water, 110; with water, 250; filter, add water, 1500; heat with Potassium Bitartrate, 38; and filter. Dry the precipitate on glass.

CHARACTERS.—Thin, transparent, garnet-red to reddish-brown scales, having a sweetish, ferruginous taste. *Solubility.*—Very soluble in water; insoluble in Alcohol.

IMPURITY.—Iron and Ammonium Tartrate.

Dose, 0.250 gm.=250 milligm. (4 gr.).

18. FERRI ET AMMONII CITRAS.—Iron and Ammonium Citrate. *Synonym.*—Ammonio-Ferric Citrate. It should contain not less than 16 per cent. of Metallic Iron.

SOURCE.—From evaporation of a solution of Ferric Citrate, 100, with Ammonia Water, 40, to consistency of syrup. Dry the precipitate on glass.

CHARACTERS.—Thin, transparent, garnet-red scales, having a saline, mildly ferruginous taste; deliquescent in moist air. *Solubility.*—Readily and completely in water; insoluble in Alcohol.

IMPURITIES.—Tartrates or citrates of the alkali metals, iron tartrate, ferrous citrate.

Dose, 0.250 gm.=250 milligm. (4 gr.).

Preparation.

Vinum Ferri.—Wine of Iron. Iron and Ammonium Citrate, 40; Tincture of Sweet Orange Peel, 60; Syrup, 100; White Wine, to 1000.

Dose, 8 c.c. (2 fl. dr.).

19. FERRI ET STRYCHNINÆ CITRAS.—Iron and Strychnine Citrate. It should contain not less than 0.9 nor more than 1 per cent. of Strychnine, and Ferric Citrate corresponding in amount to not less than 16 per cent. of Metallic Iron.

SOURCE.—Dissolve Iron and Ammonia Citrate, 98, in distilled water, 100; and Strychnine, 1, Citric Acid, 1, in distilled water, 20. Mix the solution, evaporate to the consistency of syrup and spread on plates of glass.

CHARACTERS.—Thin, transparent, garnet-red to yellowish-brown scales, having a bitter, slightly ferruginous taste. *Solubility.*—Completely in water; partially in Alcohol.

IMPURITIES.—Iron tartrate, citrates or tartrates of the alkali metals.

Dose, 0.125 gm.=125 milligm. (2 gr.).

20. FERRI ET AMMONII TARTRAS.—Iron and Ammonium Tartrate. *Synonym.*—Ammonio-Ferric Tartrate. It should contain not less than 13 per cent. of Metallic Iron.

SOURCE.—Add solution of Ferric Sulphate, 100, to Ammonia Water, 110, diluted with cold water, 250; filter, dissolve the precipitate in Tartaric Acid, 29, dissolved in distilled water; filter and evaporate to a syrupy consistence and dry on glass.

CHARACTERS.—Thin, transparent scales, from garnet-red to reddish-brown, having a sweetish, slightly ferruginous taste; slightly deliquescent in the air. *Solubility.*—Very soluble in water; insoluble in Alcohol.

IMPURITIES.—Citrates or tartrates of the alkali metals.

Dose, 0.250 gm.=250 milligm. (4 gr.).

21. FERRI CITRAS.—Ferric Citrate. It should contain not less than 16 per cent. of Metallic Iron.

SOURCE.—By evaporation of a solution of Ferric Citrate (obtained by mixing Ammonia Water with a solution of Ferric Sulphate, adding the well-washed precipitate to Citric Acid, heating until solution, filtration and evaporation) to a syrupy consistency and drying on glass.

CHARACTERS.—Thin, transparent, garnet-red scales, odorless, and having a slightly ferruginous taste. *Solubility.*—Slowly but completely in water at 25° C. (77° F.); readily in hot water; insoluble in Alcohol.

IMPURITIES.—Iron tartrate, iron and ammonium citrate, citrates or tartrates of the alkali metals.

Dose, 0.250 gm.=250 milligm. (4 gr.).

22. FERRI ET QUININÆ CITRAS.—Iron and Quinine Citrate. It should contain not less than 11.5 per cent. of dried Quinine and 13.5 per cent. of Metallic Iron.

SOURCE.—Dissolve Ferric Citrate, 85, in distilled water, 160; dissolve Quinine, 12, and Citrate Acid, 3, in distilled water, 20; mix these solutions, evaporate to a syrupy consistency and dry on glass.

CHARACTERS.—Thin, transparent, reddish-brown scales of a bitter, mildly ferruginous taste; slowly deliquescent. *Solubility.*—Slowly but completely in cold water; more readily in hot water; partially soluble in Alcohol.

IMPURITIES.—Iron tartrate and citrates or tartrates of the alkali metals.

Dose, 0.250 gm.=250 milligm. (4 gr.).

23. FERRI ET QUININÆ CITRAS SOLUBILIS.—Soluble Iron and Quinine Citrate.

SOURCE.—Dissolve Ferric Citrate, 85, in distilled water, 160, by heating; add Quinine, 12, Citric Acid, 3, previously triturated in distilled water, 20; mix these solutions and stir with Ammonia Water, 50; evaporate to a syrupy consistency and dry on glass.

CHARACTERS.—Thin, transparent scales, of a greenish, golden-yellow color, having a bitter, mildly ferruginous taste; deliquescent.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Preparation.

Vinum Ferri Amarum.—Bitter Wine of Iron. Soluble Iron and Quinine Citrate, 50; Tincture of Sweet Orange Peel, 60; Syrup, 300; White Wine to 1000.

Dose, 8 c.c. (2 fl. dr.).

24. FERRI PYROPHOSPHAS SOLUBILIS.—Soluble Ferric Pyrophosphate. It should contain Ferric Pyrophosphate corresponding in amount to not less than 10 per cent. of Metallic Iron.

SOURCE.—By solution of Ferric Citrate, 50, Sodium Pyrophosphate, 50, in distilled water, 100; evaporation and drying on glass.

CHARACTERS.—Thin, apple-green, transparent scales, having an acidulous, slightly saline taste. *Solubility.*—Freely and completely in water; insoluble in Alcohol.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Unofficial Preparations.

Ferri Arsenas.—Iron Arsenate. $3Fe(FeO)AsO_4 + 16H_2O = 1086.74$. It consists of both ferrous and ferric arsenates, with some oxide.

SOURCE.—Mix hot solutions of Sodium Arsenate and Iron Sulphate, add Sodium Bicarbonate to neutralize free Sulphuric Acid that is formed when Iron Arsenate is precipitated.

CHARACTERS.—A greenish, amorphous powder, insoluble in water.

IMPURITIES.—Sulphates.

Dose, 0.003 to 0.03 gm.; $\frac{1}{20}$ to $\frac{1}{2}$ gr. as a pill.

Ovoferrinum.—Ovoferrin. $C_{47}N_{17}SH_8Fe_8O_{22}$. *Synonym.*—Iron Vitellin.

SOURCE.—Synthesis of vitellin from serum albumin by electrolysis; separation of vitellin by fractional precipitation; suspension of vitellin in water; thorough admixture of Iron Hydroxide $[Fe_2(OH)_6]$, freshly prepared from Iron Tartrate. Heated under pressure, combination takes place.

CHARACTERS.—A clear red solution forms, to which is added sufficient water to form a 5 per cent. solution of the solid Iron Vitellin. 9 per cent. of Alcohol is added as preservative.

INCOMPATIBLES.—Strong alkalies and all fluidextracts containing large amounts of tannic acid. It is not incompatible with arsenic, strychnine or mercuric chloride in physiological doses.

Dose, 8 to 15 c.c.; 2 to 4 fl. dr.

INCOMPATIBLES OF IRON SALTS IN GENERAL.—All substances containing tannic or gallic acid form an intense black with ferric salts. Preparations of iron are therefore incompatible with all vegetable astringent solutions, and the only infusions with which they can be prescribed are infusions of quassia and of calumba. It is frequently forgotten that, on account of the presence of tannin, both the tincture and infusion of digitalis form an inky mixture with iron preparations. A small quantity of diluted phosphoric acid will serve to clarify such a mixture, though after a few days a slight precipitate of ferric phosphate will be observed. Mucilage of acacia becomes gelatinous from the addition of ferric salts. With ferrous salts, alkalies and their carbonates, lime water, calcium carbonate, and magnesia and magnesium carbonate form green precipitates, and with ferric salts, brown precipitates.

ACTION.

Some of the iron salts, such as the chloride, the nitrate, and the sulphate, are powerfully astringent and hæmostatic. Solutions of both ferrous and ferric salts are to a greater or less extent antiseptic, germicidal, disinfectant and deodorant. Iron preparations are liable to blacken the teeth and tongue, and tincture of ferric chloride destroys the dental enamel. Inorganic salts, in sufficient quantity, are gastro-intestinal irritants, and the more strongly acid ones have some caustic effect upon the stomach. Iron salts as a rule tend to constipate, and they also blacken the stools. In many cases of anæmia, and particularly of chlorosis, the number of red corpuscles and the amount of hæmoglobin in the blood are increased by the administration of iron. It is a tonic as well as a hæmatinic, improving the functions of the various organs. The continued use of ferruginous preparations is liable to interfere with the digestion, and the best tolerated ones are reduced iron, the phosphate and the pyrophosphate.

USES.

Monsel's solution and solutions of the sulphate and chloride are employed as local hæmostatics. They form disagreeable clots, however, which are liable to decompose and give rise to septic inflammation. The tincture of ferric chloride has been used both topically and internally in diphtheria and erysipelas. The astring-

ent preparations are employed in hæmorrhages from the stomach and bowels. Iron preparations are often administered to improve the appetite and digestion, as well as the condition of the blood. The styptic taste of the astringent compounds may be much diminished by giving them with glycerin. Iron in combination with strychnine or arsenic is often effective in chlorosis, and the tincture of ferric chloride, especially in the form of Basham's mixture, is much used in Bright's disease. This tincture is one of the most generally useful of all the preparations of iron. Ferrous iodide is valuable for rachitic and scrofulous children, and is frequently associated with codliver oil. Practically all of the albuminates and peptonates to be found in the shops are worthless as hæmatinics.

PART II. ORGANIC MATERIA MEDICA.

DIVISION I: THE SYNTHETICS AND ALLIED DRUGS.

GROUP I.

THE HYDROCARBONS.

Petrolatum, Petroleum Benzin, Paraffin.

These have already been considered on pp. 79–81.

GROUP II.

THE ALCOHOLS.

Ethyl Alcohol.

ALCOHOL.

Alcohol is official in the seven following forms:

1. **ALCOHOL.** *Synonyms.*—Ethylic Alcohol. Spirit of Wine. A liquid composed of about 92.3 per cent., by weight, or 94.9 per cent., by volume, of absolute Ethyl Alcohol ($C_2H_5 \cdot OH = 45.70$), and about 7.7 per cent., by weight, of water. It should be kept in well-closed vessels, in a cool place, remote from lights or fire.

SOURCE.—Macerate rectified spirit with Anhydrous Potassium Carbonate to remove the water, then again with freshly fused Calcium Chloride, and distil.

CHARACTERS.—A transparent, colorless, mobile and volatile liquid, of a slight, agreeable odor, and a burning taste. Sp. gr., about 0.816 at 15.6° C. (60° F.), the standard temperature for Alcohol, or 0.809 at 25° C. (77° F.). Readily volatilized; boils at 78° C. (172.4° F.).

IMPURITIES.—Organic impurities, amyl alcohol, aldehyde, etc.; fusel oil constituents.

Alcohol is used to make Chloroform. All spirits are made with Alcohol and all tinctures with Alcohol or Diluted Alcohol. Alcohol is used also in

most of the official wines (in addition to that in the red or white wine which they contain), and largely employed in making extracts, fluidextracts and various other preparations.

Preparation.

Alcohol Dilutum. — Diluted Alcohol. *Synonym.* — Proof Spirit. A liquid composed of about 41.5 per cent., by weight, or about 48.9 per cent., by volume, of absolute Ethyl Alcohol, and about 58.5 per cent. of water. Alcohol, 500; distilled water, 500.

CHARACTERS.—The same as those of Alcohol. Sp. gr., about 0.936 at the standard temperature for Alcohol.

2. ALCOHOL ABSOLUTUM. — Absolute Alcohol. Ethyl Alcohol, containing not more than 1 per cent., by weight, of water.

SOURCE.—By percolation of the strongest and purest Alcohol through recently burned lime, out of contact with the air; then re-distil the percolate *in vacuo*.

CHARACTERS.—A transparent, colorless, mobile and volatile liquid, of a characteristic, rather agreeable odor, and a burning taste. Very hygroscopic. Sp. gr., not higher than 0.797 at 15.6° C. (60° F.).

3. SPIRITUS VINI GALLICI.—Brandy.

SOURCE.—An alcoholic liquid obtained by the distillation of the fermented, unmodified juice of fresh grapes, and at least four years old.

CHARACTERS.—A pale, amber-colored liquid having a distinctive odor and taste, and a slightly acid reaction. Sp. gr., 0.925 to 0.941, which limits it should not exceed; corresponding, approximately, to an alcoholic strength of 39 to 47 per cent., by weight, or 46 to 55 per cent., by volume, of Absolute Alcohol.

IMPURITIES.—Fusel oil, added sugar, glycerin, aromatic substances, oak tannin (from casks), caramel coloring, free acid.

4. SPIRITUS FRUMENTI.—Whiskey.

SOURCE.—An alcohol liquid obtained by the distillation of the mash of fermented grain (such as Indian corn, rye, wheat and barley, or their mixtures), and at least four years old.

CHARACTERS.—An amber-colored liquid, having a distinctive odor and taste, and a slightly acid reaction. Sp. gr., 0.924 to 0.945, which limits it should not exceed; corresponding to the same alcoholic strength as that of Brandy.

IMPURITIES.—The same as of Brandy.

5. VINUM ALBUM.—White Wine. The Pharmacopœia recommends that when White Wine is prescribed without further specification, a dry White Wine of domestic production should be employed.

SOURCE.—An alcoholic liquid, made by fermenting the juice of fresh

grapes, the fruit of *Vitis Vinifera Linné* (Fam. *Vitaceæ*), freed from seeds, stems and skins, and subjected to the usual cellar-treatment for fining and aging.

CHARACTERS.—A pale, amber-colored, or straw-colored liquid, having a pleasant odor, free from yeastiness, and a fruity, agreeable, slightly spirituous taste, without excessive sweetness or acidity. Sp. gr., 0.990 to 1.010, which limits it should not exceed.

IMPURITIES.—Saccharin, tannic acid, salicylic acid, free acid.

6. VINUM RUBRUM.—Red Wine. A dry Red Wine of domestic production is recommended, and it should contain the same limits of Absolute Alcohol as White Wine.

SOURCE.—An alcoholic liquid, made by fermenting the juice of fresh colored grapes, in presence of their skins and subjected to cellar-treatment.

CHARACTERS.—A deep red liquid, having a pleasant odor, free from yeastiness, and a fruity, moderately astringent, pleasant, and slightly acidulous taste, without excessive sweetness or acidity. Sp. gr., 0.989 to 1.010, which limits it should not exceed.

IMPURITIES.—Saccharin, tannic acid, salicylic acid, acid fuchsine, free acid, red aniline colors.

Amount of Ethyl Alcohol by Volume in Various Important Substances.

Alcohol Absolutum	contains	99	per cent.
Alcohol Deodoratum	"	95.1	"
Alcohol	"	94.9	"
Spiritus Rectificatus	"	90	"
Spiritus Tenuior (Proof Spirit)	"	57.09	"
Rum, Gin, Strong Liqueurs	"	51 to 59	"
Alcohol Dilutum	"	48.9	"
Spiritus Vini Gallici	"	46 to 55	"
Spiritus Frumenti	"	44 to 55	"
Vinum Portense	"	20 to 30	"
Vinum Xericum or Madeira	"	16 to 22	"
Vinum Album	"	12.4 to 17.3	"
Vinum Rubrum	"	12.4 to 17.3	"
Champagne	"	10 to 13	"
Burgundy	"	9 to 12	"
Hock (Rhine)	"	9 to 12	"
Claret (Bordeaux)	"	8 to 12	"
Cider	"	5 to 9	"
Strong Ale or Stout	"	5 to 9	"
Beer or Porter	"	2 to 5	"
Kumyss	"	1 to 3	"

Action.

Alcohol is both refrigerant and rubefacient, and is also astringent, anhydrotic and slightly anæsthetic. While it is antiseptic and disinfectant, it has comparatively little bactericidal action at the temperature of the body, and alcoholization actually predisposes to bacterial infection. It generally tends to promote digestion, sharpening the appetite and increasing the flow of gastric juice, but large quantities give rise to so much local irritation that nausea and vomiting result. In concentrated form it reflexly stimulates the heart and respiration and causes dilatation of the blood-vessels, particularly those of the skin. About 90 per cent. of the alcohol absorbed from the alimentary tract undergoes combustion. In doing so it gives up energy to the body, and is therefore to be considered as a food. Alcohol is generally regarded as a central nervous stimulant, which first excites and then depresses the cerebral and other cells. Narcotic doses usually cause a considerable reduction of temperature. Alcohol is somewhat diaphoretic and diuretic. The small percentage of it which is not oxidized in the tissues is excreted unchanged, principally by the lungs and kidneys, and to a slight extent in the sweat and milk.

Uses.

Alcohol is employed as an evaporating lotion for sprains, bruises and local inflammations, and its rubefacient and astringent effects are also made use of in various conditions. Given internally, it may relieve gastric pain and is sometimes of service, especially in the form of champagne or of brandy, in small doses with ice or effervescent mineral waters, in checking nausea and vomiting. It is useful in diarrhœal affections and in intestinal as well as gastric colic. Alcohol is of immense advantage in many cases of febrile disease, when during critical periods it sustains the vital powers by supplementing the insufficient quantity of nutriment which the system is capable of appropriating and at the same time stimulating the digestion, thus enabling the patient to dispose of an increased amount of food. It is also

highly useful in arousing and supporting the flagging powers in sudden depression of the system, as in shock, syncope, severe hæmorrhage, and poisoning by various drugs. In phenol poisoning and snake-bite it likewise has a direct antidotal effect. In certain chronic conditions it is of undoubted benefit, but the danger of the patient's contracting the alcoholic habit must always be taken into consideration.

Toxicology.—Very large quantities of alcohol are capable of causing death either instantaneously, by reflex arrest of the heart, or more slowly by inducing a comatose condition in which respiratory failure at length results. Quite commonly, however, recovery follows this torpid sleep. *Chronic poisoning.*—Among the more common results are chronic gastritis, cirrhosis of the liver, and delirium tremens, but almost all the organs and tissues of the body are liable to become affected.

GROUP III.

The Aldehydes.

1. THE HALOGEN DERIVATIVES.—Formaldehyde, Hexamethylenamine, Paraldehyde, Hydrated Chloral, Chloralformamide, Chloroform, Chloretone, Trichloracetic Acid, Bromoform, Iodoform, Ethyl Chloride, Acetone, Methylthionine Hydrochloride.

I. LIQUOR FORMALDEHYDI.

SOLUTION OF FORMALDEHYDE. — *Synonyms.* — Formalin. Formol. An aqueous solution, containing not less than 37 per cent., by weight, of absolute Formaldehyde ($H \cdot COH = 29.79$), an oxidation product of Methyl Alcohol. It should be kept in well-stoppered bottles, in a cool place, protected from light.

SOURCE.—Formaldehyde, which is a gas soluble in water, is obtained by the oxidation of Methylic Alcohol at a moderately high temperature, or by passing the vapor over red-hot metal.

CHARACTERS.—A clear, colorless liquid, having a pungent odor and caustic taste; its vapor acts as an irritant upon the mucous membrane. Sp. gr., 1.075 to 1.081. *Solubility.*—Miscible in all proportions with water and Alcohol.

IMPURITIES.—Sulphate and chloride, iron, lead, copper, calcium, formic and other acids.

ACTION.

Antiseptic; disinfectant; germicidal; irritant.

USES.

Formaldehyde gas is considered the best agent at present known for the disinfection of infected dwellings. It is inferior in penetrating power to steam and dry heat at 110° C. (230° F.), but for the disinfection of fine wearing apparel, furs, leather, upholstery, books, etc., which are injured by great heat, it is better adapted than any other disinfectant. Although its irritant action is objectionable, and the pain resulting from the application of even weak solutions to raw surfaces is considerable, formaldehyde has been used quite largely in surgery and in the treatment of some forms of skin disease. It is also employed for the preservation of human bodies and of pathological specimens.

II. HEXAMETHYLENAMINA.

HEXAMETHYLENAMINE. $C_6H_{12}N_4 = 139.18$. *Synonyms.* — Urotropin. Formin. Aminoform. A condensation product [Hexamethylenetetramine $(CH_2)_6N_4$] from the action of Ammonia upon Formaldehyde.

SOURCE.—It is obtained by the action of 4 molecules of Ammonia on 6 molecules of Formaldehyde: $4H_3N + 6CH_2O = C_6H_{12}N_4 + 6H_2O$.

CHARACTERS.—Colorless, lustrous, odorless crystals, having, when in aqueous solution, an alkaline reaction. While this substance is odorless at ordinary temperatures, heating evolves a peculiar fishy odor. *Solubility.*—In about 1.5 parts of either cold or boiling water; in 10 parts of Alcohol and 8 of hot Alcohol; in 228 parts of Ether.

INCOMPATIBLES.—All acids decompose it in the presence of warmth. **Dose, 0.250 gm.=250 milligm. (4 gr.).**

ACTION.

Inhibits micro-organisms by reason of its formaldehyde, which it yields up in the body in the urine; solvent for uric acid.

USES.

Pyelitis; cystitis; urethritis; phosphaturia; uric acid diathesis; as a urinary disinfectant in typhoid fever.

III. PARALDEHYDUM.

PARALDEHYDE. $C_6H_{12}O_3 = 131.10$.—A polymer of Acetaldehyde ($CH_3 \cdot COH = 43.70$).

SOURCE.—Formed by adding a few drops of concentrated Sulphuric Acid to Aldehyde, which causes the liquid to become hot. On cooling to 0° C. (32° F.), the Paraldehyde solidifies in crystals. When distilled with dilute Sulphuric Acid, Hydrochloric Acid, etc., it is converted into Aldehyde.

CHARACTERS.—A colorless, transparent liquid, having a strong, characteristic, but not unpleasant or pungent odor, and a burning and cooling taste. Sp. gr., 0.990. *Solubility.*—In 8 parts of water and in 16.5 of boiling water; freely miscible with Alcohol, Ether, and fixed or volatile oils.

IMPURITIES.—Sulphuric and hydrochloric acids, free acid, amyl alcohol, impurities derived from fusel oil.

INCOMPATIBLES.—Alkalies, hydrocyanic acid, iodides, oxidizers.

Dose, 2 c.c. (30 ♏).

ACTION.

Antiseptic; antifermentative; hypnotic. Fatal results from it are rare, but enormous quantities may cause death by paralyzing the respiratory centre.

USES.

A powerful and safe hypnotic, without unpleasant after-effects. It often causes gastric irritation, and an objection to its use is the large dosage required; is principally used in hospitals for the insane.

IV. CHLORALUM HYDRATUM.

HYDRATED CHLORAL. $C_2HCl_3O + H_2O = 164.12$. *Synonym.*—Chloral. A crystalline solid composed of Trichloraldehyde or Chloral ($CCl_3 \cdot COH + H_2O$) with the elements of one molecule of water. It should be kept in glass-stoppered bottles, in a cool, dark place.

SOURCE.—Absolute Alcohol is saturated with dry Chlorine; Aldehyde and Hydrochloric Acid are first formed. $C_2H_5OH + Cl_2 = C_2H_4O + 2HCl$. By the continued action of the Chlorine Gas 3 atoms of Hydrogen are abstracted from the Aldehyde and replaced by 3 atoms of Chlorine, producing Chloral. $C_2H_4O + 3Cl_2 = C_2HCl_3O + 3HCl$. It is purified by Sulphuric Acid and afterwards by Lime.

CHARACTERS.—Separate, rhomboidal, colorless and transparent crystals, having an aromatic, penetrating and slightly acrid odor, and a bitterish, caustic taste; slowly volatilized when exposed to the air; easily melted by

gentle heat. *Solubility.*—Freely in water, Alcohol or Ether; also in Chloroform, Benzene, Petroleum Benzin, Carbon Disulphide, and fixed and volatile oils. It liquefies when triturated with about an equal quantity of Camphor, Menthol, Phenol or Thymol.

IMPURITIES.—Hydrochloric acid, chlorides.

INCOMPATIBLES.—Acetphenetidin, alcohol, borax, lead acetate, monobromated camphor, phenyl salicylate, potassium iodide and permanganate, quinine, sodium phosphate, urethane; all alkalies decompose it.

Dose, 1 gm. (15 gr.).

ACTION.

Antiseptic; irritant; anæsthetic; hypnotic. It slows and weakens the heart and lowers the blood-pressure; depresses the respiratory centre.

USES.

Locally as a rubefacient, counter-irritant, antiseptic and anæsthetic, but principally internally as a hypnotic. It holds the first place as a pure hypnotic, and is much employed in midwifery especially, but it should always be administered with great caution on account of its depressing effect upon the heart. It is a safer remedy for children than adults, and is often useful in controlling or alleviating the paroxysms of whooping-cough. It is indicated in tetanus and strychnine poisoning for the reason that it depresses the motor tract of the spinal cord.

Toxicology. Acute poisoning.—Wash out the stomach; try to arouse the patient by flagellation, etc.; coffee by the rectum; warmth by hot bottles and blankets; amyl nitrite by inhalation; strychnine or caffeine subcutaneously; artificial respiration. *Chronic poisoning.*—The patient suffers from digestive disturbances, marked physical and mental weakness; cardiac palpitation, dyspnœa, sleeplessness, and erythematous or petechial eruptions. In some instances there are bed-sores, ulcerations and sloughs. The chloral habit is very easily acquired and very difficult to break up, and the sudden withdrawal of the drug may lead to symptoms resembling those of delirium tremens.

V. CHLORALFORMAMIDUM.

CHLORALFORMAMIDE. $C_3H_4Cl_3NO_2 = 190.96$. *Synonym.*—Chloralamide.

SOURCE.—A crystalline solid [$CCl_3 \cdot CH(OH)NH \cdot COH$], made by the direct union of Formamide with Anhydrous Chloral. $CCl_3CHO + CHO\text{-}NH_2 = CCl_3CH \cdot OH \cdot CONH_2$.

CHARACTERS.—Colorless, lustrous crystals, without odor and of a somewhat bitter taste. *Solubility.*—In about 18.7 parts of water; in 1.3 parts of Alcohol; readily in Ether, Glycerin, Acetone and Acetic Ether. When heated with water to 60° C. (140° F.), it is hydrolized, Hydrated Chloral and Formamide being produced; it is also decomposed when warmed with alkali hydroxides, the solution at first becoming turbid, and then clear, while Chloroform separates.

IMPURITIES.—Formic, hydrochloric, and other free acids, chloral alcoholate, ethyl carbamate.

Dose, 1 gm. (15 gr.).

ACTION.

Hypnotic, but somewhat slower and less certain in its action than hydrated chloral; less irritating to the stomach, and, except in poisonous doses, without the depressant effects of chloral.

USES.

It may be employed in all cases in which hydrated chloral is indicated.

VI. CHLOROFORMUM.

CHLOROFORM.—*Synonym.*—Trichloromethane. A liquid consisting of 99 to 99.4 per cent., by weight, of absolute Chloroform [$CHCl_3 = 118.45$] and 0.6 to 1 per cent. of Alcohol.

SOURCE.—Heat water and Alcohol in a still to 37.7° C. (100° F.), then add Chlorinated Lime; Chloroform distils over. It is believed that reaction takes place as follows: On bringing together Alcohol and Chlorinated Lime, the Chlorine converts the former into Chloral, which is at once decomposed by the Calcium Hydroxide, yielding Chloroform and Calcium Formate ($Ca(CHO_2)_2$). The Calcium Formate is decomposed by another portion of Chlorinated Lime into Calcium Carbonate and Chloride, and water. $2C_2H_5OH + 10CaOCl_2 = 2CHCl_3 + 7CaCl_2 + 2CaCO_3 + Ca(OH)_2 + 4H_2O$. In late years a Chloroform quite free from Chlorinated by-products has been obtained from the distillation of Acetone (from destructive distillation of Calcium Acetate) and Chlorinated Lime, from which Chloroform is produced, together with Calcium Acetate, Hydroxide and Chloride. $2(C_3H_6O) + 6(CaOCl_2) = 2(CHCl_3) + Ca(C_2H_3O_2)_2 + 2Ca(OH)_2 + 3CaCl_2$.

CHARACTERS.—A heavy, clear, colorless, mobile and diffusible liquid, of a characteristic, ethereal odor, and a burning, sweet taste. Sp. gr., not below 1.476. It is not inflammable, but its heated vapor burns with a green flame. *Solubility.*—In about 200 times its volume of water, in which

it sinks in heavy drops; in all proportions in Alcohol, Ether, Benzene, Petroleum Benzin, and the fixed and volatile oils.

IMPURITIES.—Chlorides, free chlorine, chlorinated and odorous decomposition products, impurities decomposable by sulphuric acid.

Dose, 0.3 c.c. (5 ♏).

Preparations.

1. **Aqua Chloroformi.**—Chloroform Water. Chloroform and distilled water, by agitation, care being taken that there should always be an excess of Chloroform present.

Dose, 16 c.c. (4 fl. dr.).

2. **Emulsum Chloroformi.**—Emulsion of Chloroform. Chloroform, 40; Expressed Oil of Almond, 60; Tragacanth, 10; water to 1000.

Dose, 8 c.c. (2 fl. dr.).

3. **Linimentum Chloroformi.**—Chloroform Liniment. Chloroform, 300; Soap Liniment, 700.

4. **Spiritus Chloroformi.**—Spirit of Chloroform. *Synonym.*—Chloric Ether. Chloroform, 60; Alcohol, 940. *Strength.*—6 per cent.

Dose, 2 c.c. (30 ♏).

ACTION.

Irritant; powerfully antiseptic; a local and general anæsthetic. In the stomach in small doses it acts like the volatile oils, but it is more rapidly absorbed than they. Its effects upon the central nervous system, when inhaled, have been divided, as in the case of ether and other general anæsthetics, into three stages, the stimulant, anæsthetic and paralytic. The fatal effect of chloroform, as seen in its use as an anæsthetic in surgery, appears to be due chiefly and in most instances to its action upon the circulatory system, and chiefly upon the heart itself. A percentage of chloroform vapor so low as to be practically incapable of causing sudden death will, however, if the administration is maintained, bring about a fatal result from over-narcosis, and under these circumstances death is almost invariably due to failure of the respiration from paralysis of the respiratory centre. Fatty degeneration of various organs, especially the liver, heart and kidneys, has been observed after the repeated administration of

chloroform, and even after a single inhalation. Excretion takes place mainly by the lungs.

Uses.

Locally for the relief of pain and as a hæmostatic; internally to disguise the dose of nauseous drugs, as a stomachic in dyspepsia, and to relieve vomiting, restlessness, irritating cough, and diarrhœa. By inhalation it is universally used in obstetrics, and in Europe is the preferred anæsthetic for surgical operations. It is also employed in biliary and renal colic, for the relaxation of muscular spasm, as in the reduction of dislocations and herniæ, and for overcoming spasm in the convulsions of tetanus, hydrophobia and other affections. In syncope from chloroform narcosis some or all of the following measures may be resorted to: Artificial respiration; flicking the face and abdomen with wet towels; amyl nitrite by inhalation; strychnine or ether subcutaneously; large rectal injections of hot normal saline solution or hot coffee; inversion of the patient; the use of the Maas process, which consists of making compressions of the chest over the heart, at the rate of 120 per minute and sufficiently forcible to create an artificial carotid pulse.

Unofficial Preparation.

VII. Chloretonum. — Chloretone. *Synonyms.*—Chlorbutanol. Trichlortertiary-butyl-alcohol. Acetone Chloroform.

Source.—From equal weights of Acetone and Chloroform when Caustic Potash is added.

Characters.—A white crystalline powder having a camphoraceous odor. *Solubility.*—Sparingly in water; very soluble in Chloroform, Alcohol and Ether.

Dose, .30 to 1.20 gm.; 5 to 20 gr.

Action.

Anæsthetic; hypnotic.

Uses.

Locally as an anæsthetic to ulcers and infected wounds; internally its chief use is as a hypnotic which is both safe and generally efficient.

VIII. ACIDUM TRICHLORACETICUM.

TRICHLORACETIC ACID. $HC_2Cl_3O_2 = 162.12$.—A monobasic organic acid [$CCl_3 \cdot COOH$]. It should be kept in dark amber-colored, well-stoppered bottles in a cool place.

SOURCE.—Usually obtained by the oxidation of Hydrated Chloral with Nitric Acid.

CHARACTERS.—White, deliquescent, rhombohedral crystals, having a slight characteristic odor. *Solubility.*—Very soluble in water, Alcohol, or Ether. The aqueous solution, on boiling, is decomposed with the formation of Chloroform and Carbon Dioxide.

ACTION.

Antiseptic; escharotic.

USES.

Locally in lupus, condylomata, etc., and as a caustic in diseases of the nose and throat. It penetrates deeply, but causes less pain than many other escharotics.

IX. BROMOFORMUM.

BROMOFORM.—A liquid consisting of 99 per cent., by weight, of absolute Bromoform ($CHBr_3 = 250.99$), and 1 per cent. of absolute Alcohol. *Synonym.*—Tribromomethane. It should be kept in dark, amber-colored, glass-stoppered bottles, in a cool place, protected from light.

SOURCE.—By the action of Sodium Hypobromite (which is obtained when Bromine is added to a solution of Sodium Hydroxide) on Acetone.

CHARACTERS.—A heavy, transparent, colorless, mobile liquid, with an ethereal odor and a penetrating, sweet taste resembling Chloroform. Sp. gr., 2.808. *Solubility.*—Slightly in water, but in all proportions in Alcohol, Ether, Benzene, Petroleum Benzin, and fixed and volatile oils.

IMPURITIES.—Bromides and brominated compounds, free bromine, free acid.

INCOMPATIBLES.—Caustic alkalies; water.

Dose, 0.2 c.c. (3 ♏).

ACTION.

Anæsthetic; inhaled, the narcosis it produces is shorter than that of ether or chloroform.

USES.

A remedy of value for whooping-cough, in which it may be administered internally. Great caution should be employed in its use, however, as cases of poisoning from it have been reported.

X. IODOFORMUM.

IODOFORM. $CHI_3 = 390.61$.—Triiodemethane, usually obtained by the action of Iodine upon Alcohol, in the presence of an alkali or alkali carbonate. It should be kept in well-stoppered bottles, in a cool and dark place.

SOURCE.—Heat together Alcohol, Iodine, Potassium Bicarbonate, and water. $C_2H_6O + 4I + 2KHCO_3 = 2CHI_3 + 2KI + 3H_2O + 2CO_2$.

CHARACTERS.—A fine, lemon-yellow powder, or lustrous crystals of the hexagonal system, having a peculiar, very penetrating and persistent odor, and an unpleasant, slightly sweetish, and iodine-like taste. *Solubility.*—In 9391 parts of water, to which it imparts its odor and taste; in 46.7 parts of Alcohol and 12 of boiling Alcohol; in 5.2 parts of Ether; soluble in Chloroform, and fixed and volatile oils; slightly in Petroleum Benzin. It contains 96.7 per cent. of Iodine.

IMPURITIES.—Soluble iodides, free acids, soluble yellow coloring matters, picric acid, etc.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Preparation.

Unguentum Iodoformi.—Iodoform Ointment. Iodoform, 10; Lard, 90.

ACTION.

It is anæsthetic to raw surfaces, and has been supposed to be antiseptic and disinfectant. It is now known that this is not the case, and the benefit from its local use is explained on the ground of a supposed action on the abraded surface, in consequence of which the latter secretes less fluid, and thus affords a less suitable medium for the growth of microbes. The crust which it forms also probably tends to retard such growth. Internally it is capable of causing symptoms of cerebral excitement, especially delirium and mania (but in exceptional instances a comatose condition), followed by collapse. The action of the heart is feeble and accelerated. Iodoform is chiefly excreted in the urine in the form of iodides. It is absorbed quite freely from wounds, and many cases of poisoning have occurred in this way.

USES.

Employed in the treatment of all sorts of wounds, ulcers and sores, and is especially beneficial in tuberculous and syphilitic

ulcerations. Various substances have been employed, with indifferent success, to disguise its disagreeable odor. Its internal use has now been practically abandoned.

XI. ÆTHYLIS CHLORIDUM.

ETHYL CHLORIDE.—A haloid derivative (Monochlor-Ethane, $C_2H_5Cl = 64.00$). *Synonyms.*—Hydrochloric Ether. Chlorethyl. It should be preserved in hermetically sealed glass tubes, and kept in a cool place, remote from lights or fire.

SOURCE.—By the action of Hydrochloric Acid gas upon absolute Ethyl Alcohol.

CHARACTERS.—A colorless, mobile, very volatile liquid, having a characteristic, rather agreeable odor, and a burning taste. It boils at a temperature of 12.5° to 13° C. (54.5° to 55.4° F.). Sp. gr., 0.918 at 8° C. (46.4° F.). *Solubility.*—Slightly in water; readily in Alcohol.

IMPURITIES.—Alcohol, hydrochloric acid, sulphur compounds.

ACTION.

Locally anæsthetic.

USES.

In minor surgical operations, dentistry, etc.

XII. ACETONUM.

ACETONE. *Synonym.*—Dimethylketone. A liquid containing not less than 99 per cent., by weight, of absolute Acetone (Dimethylketone, $CH_3 \cdot CO \cdot CH_3 = 57.61$). It should be kept in well-closed vessels in a cool place, remote from lights and fire.

SOURCE.—It is contained in considerable quantities in the product obtained in the distillation of wood, and can be separated from the mixture after the removal of the Acetic Acid. It may be purified by agitating a mixture containing it with a concentrated solution of Mono-Sodium Sulphite. It unites with the salt, forming a compound analogous to that formed with Aldehyde. The double compound can be separated, and when distilled with the addition of Potassium Carbonate, Acetone passes over.

CHARACTERS.—A transparent, colorless, mobile and volatile liquid of a characteristic ethereal odor and a pungent, sweetish taste. Sp. gr., 0.790. *Solubility.*—Miscible with water in all proportions, without cloudiness; also miscible with Alcohol, Ether, Chloroform and volatile oils.

IMPURITY.—Empyreumatic substances.

ACTION.

Anæsthetic; hypnotic; anthelmintic.

USES.

It has been given in rheumatism and gout, but its principal use is in pharmacy; it is employed in the preparation of chloroform and sulphonal and as a solvent for resins, fats, camphors, gun-cotton, etc.

XIII. METHYLTHIONINÆ HYDROCHLORIDUM.

METHYLTHIONINE HYDROCHLORIDE (Tetramethylthionine Hydrochloride). Methylene Blue.—$C_{16}H_{18}N_3SCl = 317.36$.

SOURCE.—By the action of Hydrogen Sulphide upon the oxidation product of Para-amido-dimethyl-aniline.

CHARACTERS.—A dark green, crystalline powder, or in the form of prismatic crystals having a bronze-like lustre. *Solubility.*—Readily in water and somewhat less readily in Alcohol, the solution having a deep blue color.

IMPURITIES.—Arsenic; commercial dye, and other mineral impurities.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

ACTION.

Antiseptic; anodyne; diuretic.

USES.

Rheumatism; migraine; sciatica and other neuralgias; gonorrhœa; malarial fever; alcoholic neuritis; mania and paretic dementia.

2. THE SULPHUR DERIVATIVES.—Sulphonmethane, Sulphonethylmethane.

I. SULPHONMETHANUM.

SULPHONMETHANE. $C_7H_{16}S_2O_4 = 226.55$. *Synonym.*—Sulphonal.—Diethylsulphonedimethylmethane $[(CH_3)_2C(SO_2C_2H_5)_2]$, the product of the oxidation of the Mercaptol obtained by the condensation of Acetone with Ethylmercaptan.

SOURCE.—Mercaptan (Ethyl Hydrosulphide) is combined with Acetone to form Mercaptol, which by oxidation with Potassium Permanganate yields Sulphonmethane.

CHARACTERS.—Colorless, inodorous, and nearly tasteless prismatic crystals. *Solubility.*—In 360 parts of water and 15 of boiling water; in 47 parts of Alcohol and 2 of boiling Alcohol; in 45 parts of Ether and 16 of Chloroform; soluble in Benzene; readily in Alcohol and Ether.

IMPURITIES.—Sulphates, chlorides, readily oxidizable organic impurities.

Dose, 1 gm. (15 gr.).

ACTION.

Hypnotic; has no depressing cardiac action. It is apt to cause a discoloration of the urine from the presence of a reddish-brown pigment, hæmatoporphyrin.

USES.

While it is less dangerous than hydrated chloral, it is also less efficient. As its excretion appears to be slower than its absorption, there is a tendency to a cumulative action, and several fatalities have been reported from its use for long periods.

II. SULPHONETHYLMETHANUM.

SULPHONETHYLMETHANE. $C_8H_{18}S_2O_4 = 240.46$. *Synonym.*—Trional.—Diethylsulphonmethylethylmethane $[(CH_3)(C_2H_5)C(SO_2C_2H_5)_2]$, a product of the oxidation of the Mercaptol obtained by the condensation of Methylethylketone with Ethylmercaptan. It contains three Ethyl groups, instead of two, like Sulphonal.

SOURCE.—It is prepared in the same way as Sulphonmethane, except that Methylethylketone is used in place of Acetone.

CHARACTERS.—Colorless, lustrous, odorless, crystalline scales, which have a bitter taste in aqueous solution. *Solubility.*—In 195 parts of water; more soluble in boiling water; readily in Alcohol and Ether.

IMPURITIES.—The same as those of Sulphonmethane.

Dose, 1 gm. (15 gr.).

ACTION.

A prompt hypnotic, without unpleasant after-effects or cumulative action.

USES.

As it is more soluble, quickly absorbed and active, it is generally preferred to sulphonal.

3. THE UREA DERIVATIVES.—Ethyl Carbamate, Veronal.

I. ÆTHYLIS CARBAMAS.

ETHYL CARBAMATE. $C_3H_7NO_2 = 88.42$. *Synonyms.*—Urethane. Ethyl Urethane. An ester of Carbamic Acid $[CO(OC_2H_5)NH_2]$.

SOURCE.—By the reaction of Ethyl Alcohol upon Urea (Carbamide) or one of its salts.

CHARACTERS.—Colorless, columnar crystals or scales; odorless, and having a saline, cooling taste. *Solubility.*—In less than 1 part of water;

0.6 part of Alcohol; 1 part of Ether; 1.3 parts of Chloroform; 3 parts of Glycerin.

IMPURITY.—Urea or carbamide.

Dose, 1 gm. (15 gr.).

ACTION.

Hypnotic.

USES.

It is most successful in cases where there is no pain and where the sleeplessness is considerably a matter of habit.

Unofficial Preparation.

II. Veronalum.—Veronal. $C_8H_{12}N_2O_3$. *Synonym.*—Diethyl-malonyl urea.

CHARACTERS.—In colorless crystals, of a feebly bitter taste, fusing at 191° C. (375.8° F.). *Solubility.*—In about 12 parts of hot and in 145 parts of cold water.

Dose, 0.5 gm. to 1.5 gm. (7½ to 22½ gr.).

ACTION.

Has a sedative influence upon the brain and to a slight extent is an analgesic. It does not influence either circulation or respiration, nor does it interfere with the functions of the kidneys.

USES.

Veronal is employed as a hypnotic in the various forms of insomnia and in maximum doses in the excitement of the psychoses.

GROUP IV.

The Ethers.

Ether, Acetic Ether, Spirit of Nitrous Ether, Amyl Nitrite, Nitroglycerin, Sodium Nitrite, Erythrol Nitrate.

I. ÆTHER.

ETHER. *Synonyms.*—Ethylic Ether. Ethyl Oxide. A liquid composed of about 96 per cent., by weight, of absolute Ether [$(C_2H_5)_2O = 73.52$], and about 4 per cent. of Alcohol containing a little water. It should be kept in partially-filled, well-stoppered containers, preferably tin cans, in a cool place, remote from lights or fire.

SOURCE.—Alcohol is distilled with Sulphuric Acid. Ethyl Sulphuric (Sulphovinic) Acid and water are first formed. $C_2H_5OH + H_2SO_4 = C_2H_5HSO_4 + H_2O$; then $C_2H_5HSO_4 + C_2H_5OH = (C_2H_5)_2O + H_2SO_4$. This process is theoretically continuous, the Sulphuric Acid last formed again acting on fresh Alcohol as it is supplied. The Ether is freed from water by re-distillation with Calcium Chloride and Lime.

CHARACTERS.—A transparent, colorless, mobile liquid, having a characteristic odor, and a burning and sweetish taste. It is highly volatile and inflammable; its vapor, when mixed with air and ignited, explodes violently. It boils at about 35.5° C. (96° F.). Sp. gr., 0.716 to 0.717. *Solubility.*—In about 10 volumes of water; miscible, in all proportions, with Alcohol, Chloroform, Petroleum Benzin, and fixed and volatil oils.

IMPURITIES.—Water, alcohol, aldehyde.

Dose, 1 c.c. (15 ♏).

Ether is used to make Collodium Stypticum.

Preparations.

1. **Oleum Æthereum.**—Ethereal Oil. A volatile liquid composed of equal volumes of heavy Oil of Wine and Ether. Alcohol, 1000; Sulphuric Acid, 1000; distilled water, 25; Ether, a sufficient quantity; by distillation.

CHARACTERS.—A transparent, nearly colorless, volatile liquid, of a peculiar, aromatic, ethereal odor, a pungent, refreshing, bitterish taste, and a neutral reaction. Sp. gr., 0.905.

2. **Spiritus Ætheris.**—Spirit of Ether. Ether, 325; Alcohol, 675.

Dose, 4 c.c. (1 fl. dr.).

3. **Spiritus Ætheris Compositus.**—Compound Spirit of Ether. *Synonym.*—Hoffmann's Anodyne. Ether, 325; Alcohol, 650; Ethereal Oil, 25.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

A local and general anæsthetic; antispasmodic; carminative; stimulant; irritant to the kidneys. Is excreted by the lungs.

USES.

Occasionally used for local anæsthetic purposes and very commonly as a general anæsthetic; safer than chloroform, but may have serious after-effects: excessive vomiting, pulmonary congestion, nephritis, etc. Employed internally for colic and some forms of

dyspepsia and both internally and subcutaneously as a diffusible stimulant, acting promptly on the heart.

II. ÆTHER ACETICUS.

ACETIC ETHER. *Synonym.*—Ethyl Acetate. A liquid composed of about 90 per cent., by weight, of Ethyl Acetate ($CH_3CO \cdot OC_2H_5 = 87.40$), and about 10 per cent. of Alcohol containing a little water.

SOURCE.—A mixture of Sodium Acetate, Sulphuric Acid and Alcohol is distilled. $C_2H_5OH + NaC_2H_3O_2 + H_2SO_4 = C_2H_5C_2H_3O_2 + NaHSO_4 + H_2O$. The distillate is purified from acid and water by digestion with Potassium Carbonate.

CHARACTERS.—A transparent, colorless liquid, of a fragrant and refreshing, slightly acetous odor, and a peculiar acetous and burning taste. Sp. gr., 0.883 to 0.895. *Solubility.*—In about 9 parts of water; miscible, in all proportions, with Alcohol, Ether, and fixed and volatile oils.

IMPURITIES.—Alcohol, water, butylic and amylic derivatives, readily carbonizable organic impurities.

Dose, 1 c.c. (15 ♏).

ACTION.

Resembles ether in its carminative, stimulant and antispasmodic properties, but its action is less prompt and more prolonged, and it is more irritating to the skin. Its anæsthetic effect is too slow to be of practical utility.

USES.

Employed internally for the same purposes as ether, and sometimes applied externally, with friction, as a resolvent and for the relief of rheumatic and other pains. The inhalation of its vapor allays laryngeal and bronchial irritation, and may also be useful in nervous cough.

III. SPIRITUS ÆTHERIS NITROSI.

SPIRIT OF NITROUS ETHER. *Synonym.*—Sweet Spirit of Nitre. An Alcoholic Solution of Ethyl Nitrite ($NO \cdot OC_2H_5 = 74.51$), yielding, when freshly prepared, not less than 4 per cent. of Ethyl Nitrite. In many commercial specimens there is very little Ethyl Nitrite.

SOURCE.—Mix Sulphuric Acid, 40, with water, 120, cool, add Alcohol, 85, diluted with an equal volume of water, and pour the solution into a flask surrounded by a mixture of ice and water. Dissolve Sodium Nitrate, 100, in water, 280, filter, and allow the liquid to drop slowly into the flask

containing the acid mixture. When the reaction is complete, allow any crystals which may have formed to settle, and decant the cold mixture of Ethyl Nitrite and aqueous solution, drawing off and discarding the aqueous liquid. Wash the separated Ethyl Nitrite with ice-cold water, remove traces of acid by Monohydrated Sodium Carbonate, 0.6, dissolved in water; agitate with Potassium Carbonate 3, to remove all traces of water, and add sufficient Alcohol.

CHARACTERS.—A clear, mobile, volatile, inflammable liquid of a pale yellowish or faintly greenish-yellow tint, having a fragrant, ethereal and pungent odor, free from acridity, and a sharp, burning taste. Sp. gr., about 0.823.

IMPURITY.—Aldehyde.

INCOMPATIBLES.—Acetanilide, acetphenetidin, antipyrine, carbonates, fluidextract of buchu, ferrous sulphate, iodides, tincture of guaiacum, gallic and tannic acids, emulsions.

Dose, 2 c.c. (30 ♏).

Spirit of Nitrous Ether in contained in Mistura Glycyrrhizæ Composita.

ACTION.

Locally anæsthetic; slightly diaphoretic and diuretic; stimulant; carminative; antispasmodic. Its action as a nitrite is very feeble.

USES.

Feverishness; adynamic conditions; flatulence; nausea; asthma and bronchitis.

IV. AMYLIS NITRIS.

AMYL NITRITE.—A liquid containing about 80 per cent. of Amyl (principally Iso-Amyl) Nitrite ($C_5H_{11}NO_2 = 116.24$), together with variable quantities of undetermined compounds. It should be kept in hermetically sealed glass bulbs or in small, dark amber-colored, glass-stoppered vials, in a cool and dark place.

SOURCE.—By action of Sodium Nitrite and Diluted Sulphuric Acid upon Amylic Alcohol. $2C_5H_{11}OH + 2NaNO_2 + H_2SO_4 = 2C_5H_{11}NO_2 + Na_2SO_4 + 2H_2O$. Purify the distillate with Sodium Carbonate.

CHARACTERS.—A clear, yellowish liquid, of a peculiar, ethereal, fruity odor, and a pungent, aromatic taste; inflammable and very volatile. Sp. gr., 0.865 to 0.875. *Solubility.*—Almost insoluble in water; freely miscible with Alcohol or Ether.

IMPURITIES.—Free acid, water, aldehyde.

Dose, 0.2 c.c. (3 ♏).

ACTION.

When inhaled it causes a dilatation of the blood-vessels, with instantaneous flushing of the face, pain, giddiness and sense of fullness in the head, and a rapid and tumultuous action of the heart. This is followed by a marked fall of blood-pressure, and the nitrites are regarded as the most powerful pressure-depressants known. The respiration is at first stimulated, and afterwards depressed, and if the action is maintained sufficiently long, death by asphyxia occurs from paralysis of the respiratory centre, the immediate cause of the asphyxia being the production of methæmoglobin.

USES.

Angina pectoris with high arterial tension; cardiac dyspnœa; spasmodic conditions; epilepsy; seasickness and vomiting of pregnancy; algid stage of pernicious malarial fever. It is administered by inhalation.

V. GLYCERYLIS NITRAS (Nitroglycerin).

SPIRITUS GLYCERYLIS NITRATIS.—Spirit of Glyceryl Trinitrate. Spirit of Nitroglycerin. *Synonym.*—Spirit of Glonoin. An alcoholic solution containing 1 per cent., by weight, of Glyceryl Trinitrate [$C_3H_5(O \cdot NO_2)_3 = 225.44$]. Great care should be exercised in handling it, since a dangerous explosion may result if any considerable quantity of it be spilled, and the Alcohol be partly or wholly lost by evaporation. If, through accident, it be spilled, a solution of Potassium Hydroxide should at once be poured over it, to effect decomposition.

SOURCE.—Nitroglycerin is prepared by gradually adding dehydrated Glycerin to Nitric and strong Sulphuric Acid, the result being Propenyl trinitrate or Trinitroglycerin. $C_3H_5(OH)_3 + 3HNO_3 = C_3H_5(NO_3)_3 + 3H_2O$. It separates as an oily layer which is washed with water and with dilute soda solution to remove all acid.

CHARACTERS.—A clear, colorless liquid, having the odor and taste of Alcohol. *Caution should be exercised in tasting it,* since even a small quantity is liable to produce a violent headache. The same effect is produced when it is freely applied to the skin. Sp.gr., 0.814 to 0.820.

Dose, 0.05 c.c. (1 ♏).

ACTION.

Similar to that of amyl nitrite, but less rapid and more prolonged in effect; causes severe and often persistent frontal head-

ache. Nitroglycerin is a nitrate, but is converted into nitrite in the blood. An over-dose may cause vomiting and purging, and possibly death from failure of the respiration.

USES.

For the relief of symptoms associated with the high tension pulse of chronic renal degeneration, and generally in cases of habitual high pressure; it may also be given in the various affections in which amyl nitrite is used, and it has the advantage of being more lasting in its effects. Anticipated attacks of angina pectoris may often be warded off by its timely use, and it is of service in counter-acting the vaso-constrictor effects of digitalis.

VI. SODII NITRIS.

SODIUM NITRITE.—$NaNO_2 = 68.57$. It should contain not less than 90 per cent. of pure Sodium Nitrite ($NO \cdot ONa$).

SOURCE.—Made by heating Sodium Nitrate with Lead, which becomes an oxide, taking oxygen from the nitrate. $NaNO_3 + Pb = NaNO_2 + PbO$.

CHARACTERS.—White, or nearly white, opaque, fused masses, or pencils, or colorless, transparent, hexagonal crystals; odorless, and having a mild, saline taste. When exposed to the air, the salt deliquesces and is gradually oxidized to Sodium Nitrate. *Solubility.*—In about 1.4 parts of water; very soluble in boiling water; slightly soluble in Alcohol.

IMPURITIES.—Heavy metals.

Dose, 0.065 gm.=65 milligm. (1 gr.).

ACTION.

Large doses produce effects similar to those of amyl nitrite, but it is both absorbed and eliminated more slowly than either this or nitroglycerin. It is apt to give rise to disagreeable eructations, and some gastro-intestinal irritation often results from the nitric acid formed from it.

USES.

Occasionally employed as a substitute for amyl nitrite or nitroglycerin.

Unofficial Preparation.

VII. Erythrol Nitras.—Erythrol Nitrate. $(CH_2ONO_2)_2(CHO \cdot NO)_2)_2 = 281.44$. *Synonym.*—Erythrol Tetranitrate.

SOURCE.—By the nitration of Erythrite ($C_4H_6(OH_4)$).

CHARACTERS.—Hard, colorless, acicular crystals. *Solubility.*—Insoluble in water; in 60 parts Absolute Alcohol.

Dose, .03 to .06 gm.; ½ to 1 gr.

ACTION.

The general action of the nitrites, causing dilatation of the vessels and a pronounced fall in blood-pressure, together with the formation of methæmoglobin; but these effects are produced more slowly and last much longer than in the case of other drugs of this group.

USES.

Of special service in warding off attacks of angina pectoris; by many considered the best drug of the series for the relief of some of the symptoms of Bright's disease, and in cardiac affections, whether associated with renal trouble or not, it can often be relied upon with great confidence.

GROUP V.

The Phenols and Phenol Derivatives.

Phenol, Liquefied Phenol, Sodium Phenolsulphonate, Zinc Phenolsulphonate, Cresol, Lysol, Thymol Iodide, Resorcinol, Losophan.

I. PHENOL.

PHENOL. $C_6H_5OH = 93.34$. *Synonyms.*—Carbolic Acid. Phenyl Alcohol. It should contain not less than 96 per cent. of absolute Phenol, and should be kept in dark amber-colored, well-stoppered bottles.

SOURCE.—Hydroxybenzene, obtained either from Coal Tar by fractional distillation and subsequent purification, or made synthetically.

CHARACTERS.—Colorless, interlaced or separate needle-shaped crystals, or a white crystalline mass, sometimes acquiring a reddish tint; having a characteristic, somewhat aromatic odor, and, when copiously diluted with water, a sweetish taste, with a slightly burning after-taste. Pure Phenol does not absorb moisture from the atmosphere, but usually it retains a minute quantity of water, by which it becomes deliquescent. With a little more water, it forms an oily liquid, which crystallizes at a lower temperature. Phenol is liquefied by the addition of about 8 per cent. of water. When gently heated, it melts, forming a highly refractive liquid. It has a faintly acid reaction. *Solubility.*—In 19.6 parts of water, the solubility varying according to the degree of hydration of the Phenol. Freely in Alcohol, Ether,

Chloroform, Benzene, Carbon Disulphide, Glycerin, fats and oils. Solution in water is more easily made if an equal part of Glycerin is added.

IMPURITIES.—Creosote, cresol.

INCOMPATIBLES.—Albumin, acetanilide, acetphenetidin, antipyrine, camphor, collodion, ferric salts, hydrogen oxide, hydrated chloral, lead acetate, menthol, phenyl salicylate, potassium permanganate, pyrogallol, resorcinol, sodium phosphate, terpin hydrate, thymol.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Preparation.

Unguentum Phenolis. — Ointment of Phenol. Phenol, 3; White Petrolatum, 97.

II. PHENOL LIQUEFACTUM.

LIQUEFIED PHENOL.—A liquid composed of not less than 86.4 per cent. of absolute Phenol, and about 13.6 per cent., by weight, of water.

SOURCE.—Liquefy Phenol, a convenient quantity, by placing the unstoppered container in a water-bath, and apply heat gradually until the crystals have melted; transfer the liquid to a tared vessel and weigh; then add for each 9 parts, by weight, of Phenol, 1 part, by weight, of Distilled Water, and mix thoroughly.

CHARACTERS.—A colorless liquid, which may develop a slight reddish tint upon keeping, having the general characteristics of Phenol. Sp. gr., about 1.065. *Solubility.*—In 12 parts of water; miscible, in all proportions, with Alcohol, Ether and Glycerin.

Dose, 0.05 c.c. (1 ♏).

Preparation.

Glyceritum Phenolis.—Glycerite of Phenol. Liquefied Phenol, 20; Glycerin, 80.

Dose, 0.3 c.c. (5 ♏).

ACTION.

Irritant; caustic; antiseptic; disinfectant; deodorant; parasiticidal; antizymotic; antipyretic; in solutions of moderate strength, local anæsthetic. The heart and respiration are at first stimulated and afterwards depressed. Smokiness of the urine is a characteristic feature.

USES.

As a disinfectant for surgical instruments, soiled linen, hospital apparatus, drains, privies, etc.; as an application for burns, carbuncle, endo-cervicitis, lupus, condylomata and various other

conditions; as an injection for leucorrhœa and gonorrhœa in the female; as a local anæsthetic. Its antipruritic and parasiticidal qualities render it useful in many cutaneous affections, and it is employed locally in hay fever, influenza and nasal catarrh. In the treatment of wounds it has been largely superseded by more powerful germicides. Internally: gastro-intestinal irritation; malarial fever, typhoid fever, scarlet fever and other zymotic diseases; influenza; by hypodermatic injection in tetanus and bubonic plague.

Toxicology.—Corrosion and charring of the mucous membrane of the mouth, œsophagus and stomach. Death from collapse may occur within a few minutes. When it is less sudden, there are vertigo, contracted pupils, pallor of the face, enfeebled circulation, and embarrassed respiration. The patient soon passes into insensibility and the symptoms often resemble those of apoplexy. Cases of poisoning have occurred from absorption of the drug from wounded surfaces, and from the rectum, uterus, etc. *Treatment.*—If the poison has been taken by the mouth, evacuate the stomach as quickly as possible; white of egg or thick soap-suds; saccharated lime; diluted vinegar; hot applications and frictions; artificial respiration; brandy, ether, atropine or caffeine subcutaneously; alcohol by the mouth. Pure alcohol is the best antidote. As soon as practicable the bowels should be moved with sodium or magnesium sulphate, and the soluble sulphates should be given in small doses for several days to favor elimination.

III. SODII PHENOLSULPHONAS.

SODIUM PHENOLSULPHONATE. $NaC_6H_4(OH)SO_3 + 2H_2O =$ 230.45. *Synonym.*—Sodium Paraphenolsulphonate. It should contain not less than 99 per cent. of pure Sodium Paraphenolsulphonate [$C_6H_4(OH)SO_3Na$ 1:4 + $2H_2O$].

SOURCE.—Phenolsulphuric Acid is formed by adding Sulphuric Acid to crystallized Phenol; on heating this mixture it becomes Paraphenolsulphuric Acid, which yields a clear solution with water. $C_6H_5OH + H_2SO_4 = C_6H_5HSO_4 + H_2O$. Barium Carbonate is then added, and Barium Phenolsulphonate is precipitated. $2C_6H_5HSO_4 + BaCO_3 = Ba(SO_3C_6H_4(OH))_2 + H_2O + CO_2$. This is treated with water and Sodium Carbonate; a solution of Sodium Phenolsulphonate is formed, and Barium Carbonate is precipitated. $Ba(SO_3C_6H_4(OH))_2 + Na_2CO_3 = 2NaSO_3C_6H_4(OH) + BaCO_3$. The solution is evaporated to crystallization.

CHARACTERS.—Colorless, transparent, rhombic prisms; odorless, and having a cooling, saline, slightly bitter taste. Somewhat efflorescent in dry

air. *Solubility.*—In 4.8 parts of water and in 0.7 part of boiling water; in about 130 parts of Alcohol and 20 of boiling Alcohol.

IMPURITIES.—Heavy metals.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

IV. ZINCI PHENOLSULPONAS.

ZINC PHENOLSULPHONATE.—$Zn(C_6H_4(OH)SO_3)_2 + 8H_2O = 552.56$. *Synonym.*—Zinc Paraphenolsulphonate. It should contain, in unaffloresced crystals, not less than 99.5 per cent. of pure Zinc Paraphenolsulphonate $[(C_6H_4(OH)SO_3)_2Zn : 1 : 4 + 8H_2O]$.

SOURCE.—Phenolsulphuric Acid is formed by adding Sulphuric Acid to Phenol. This is treated with Zinc Oxide; the Zinc Phenolsulphonate crystallizes out on evaporation.

CHARACTERS.—Colorless, transparent, rhombic prisms or tabular crystals; odorless, and having an astringent, metallic taste. Exposed to the air the salt effloresces, and upon exposure to light and air may become slightly pink. *Solubility.*—In 2.7 parts of water or Alcohol and in 0.3 part of boiling water, and 0.56 part of boiling Alcohol.

IMPURITIES.—The sulphate and chloride, arsenic, cadmium, lead, copper.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

ACTION.

Similar to that of phenol; less irritant and poisonous, and also probably less antiseptic. The zinc preparation is strongly astringent.

USES.

Externally as antiseptics and internally as disinfectants and antifermentatives. Zinc phenolsulphonate is used as an astringent for indolent or foul ulcers and in subacute inflammations of mucous membranes.

V. CRESOL.

CRESOL. $C_7H_7 \cdot OH = 107.25$.—It should be preserved in amber-colored bottles, protected from light.

SOURCE.—A mixture $[C_6H_4(CH_3)OH]$ of the three isomeric Cresols obtained from Coal Tar, freed from Phenol, hydrocarbons and water.

CHARACTERS.—A colorless or straw-colored refractive liquid, having a phenol-like odor, and turning yellowish-brown on prolonged exposure to light. Sp. gr., 1.038. *Solubility.*—In 60 parts of water; miscible in all proportions, with Alcohol, Ether, Glycerin, Benzene and Petroleum Benzin; also miscible with alkali hydroxide solutions.

IMPURITIES.—Phenol, hydrocarbons.

Dose, 0.05 c.c. (1 m).

Preparation.

Liquor Cresolis Compositus.—Compound Solution of Cresol. Cresol, 500; Linseed Oil, 350; Potassium Hydroxide, 80; Water to 1000.

ACTION.

Similar to that of phenol, though its germicidal power is considerably greater.

USES.

The same as phenol and the phenolsulphonates.

Unofficial Preparation.

VI. Lysolum.—Lysol. A substance containing about 50 per cent. of Cresol.

SOURCE.—From tar oil by dissolving in fat and saponifying with Alcohol.

CHARACTERS.—A brown, oily-looking clear liquid, with a feeble aromatic odor. *Solubility.*—Soluble in all proportions in water (forming a clear, frothing, saponaceous liquid), in Alcohol, Chloroform and Glycerin.

ACTION.

Antiseptic; even less poisonous than creolin.

USES.

Employed in much the same conditions as cresol; has been used successfully in lupus, pityriasis versicolor, and other skin diseases. The more recent official preparations of phenol have largely replaced this substance.

VII. THYMOLIS IODIDUM.

THYMOL IODIDE. $C_{20}H_{24}O_2I_2 = 545.76$. — *Synonyms.* — Dithymol-diiodide. Aristol. Dithymol-diiodide [$(C_6H_2 \cdot CH_3 \cdot C_3H_7 \cdot OI)_2$], obtained by the condensation of two molecules of Thymol and the introduction into its phenolic groups of two atoms of Iodine. It contains 45 per cent. of Iodine. Thymol Iodide should be kept in amber-colored vials, protected from light.

SOURCE.—It is prepared by the decomposition of a solution of Iodine in Potassium Iodide by Thymol dissolved in a solution of Sodium Hydroxide. The precipitate is washed with water and dried.

CHARACTERS.—A bright, chocolate-colored or reddish-yellow, bulky powder, with a very slight aromatic odor. *Solubility.*—Insoluble in water

and Glycerin; soluble in Ether, Chloroform, Collodion and oils; slightly soluble in Alcohol.

IMPURITIES.—Iodides, free iodine, sodium carbonate, inorganic impurities.

ACTION.

Non-irritant, and in its local action resembles iodoform, though less desiccant.

USES.

As a substitute for iodoform, and in the same kinds of affections. Very efficacious in the treatment of burns. In surgery, when dusted upon serous membranes it tends to prevent their adhesion.

VIII. RESORCINOL.

RESORCINOL. $C_6H_6(O)_2 = 109.22$.—*Synonyms.*—Resorcin. Metadioxybenzol. It should be kept in dark amber-colored vials.

SOURCE.—This is a diatomic phenol [Metadihydroxybenzene, $C_6H_4(OH)_2$ 1:3], usually obtained by the reaction of fused Sodium Hydroxide upon Sodium Metabenzenedisulphonate.

CHARACTERS.—Colorless, needle-shaped crystals, having a faint, peculiar odor, and a sweetish and afterwards bitter taste. It acquires a pinkish tint on exposure to light and air. *Solubility.*—In 0.5 part of water; slightly more soluble in Alcohol; very soluble in boiling water or boiling Alcohol; also readily soluble in Ether or Glycerin; very slightly soluble in Chloroform, Carbon Disulphide, and Benzene.

IMPURITIES.—Phenol, quinol, catechol, empyreumatic bodies.

INCOMPATIBLES.—Acetanilide, alkalies, antipyrine, camphor, ferric chloride, menthol, spirit of nitrous ether, urethane.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

ACTION.

Powerfully antiseptic.

USES.

Locally in dandruff, alopecia and chronic skin diseases; internally in fermentative dyspepsia, etc.

Unofficial Preparation.

IX. Losophanum.—Losophane. $C_6HI_3(OH)(CH_3)$. *Synonym.*—Triiodometacresol. It contains 80 per cent. of Iodine.

SOURCE.—Prepared by the action of Iodine upon Meta-oxytoluic Acid in the presence of a definite quantity of alkali.

CHARACTERS.—It crystallizes in colorless and odorless needles, slightly acid, melting at 121.5° C. (251° F.). *Solubility.*—With difficulty in Alcohol, but readily in Ether, Benzene and Chloroform.

ACTION.

Antiseptic.

USES.

Parasitic skin diseases and chronic eczema and prurigo. It may be employed as a 1 to 2 per cent. solution in 3 parts alcohol and 1 part water, or in ointments with vaseline or lanolin. Its therapeutic value is denied by some observers.

GROUP VI.

The Naphthalenes.

Naphthalene, Betanaphthol.

I. NAPHTHALENUM.

NAPHTHALENE. $C_{10}H_8 = 127.10$. *Synonym.*—Naphthalin. It should be kept in well-stoppered amber-colored bottles.

SOURCE.—A Hydrocarbon obtained from Coal Tar by distillation between 180° and 250° C. (356° and 482° F.). The impure Naphthalene is treated successively with Sodium Hydroxide and Sulphuric Acid, and is purified by distillation in the presence of steam, and by treating with concentrated Sulphuric Acid, distilling and crystallization.

CHARACTERS.—Colorless, shining, transparent laminæ, having a strong, characteristic odor, resembling that of Coal Tar, and a burning aromatic taste; slowly volatilized on exposure to air. *Solubility.*—Insoluble in water, though when boiled with it the water acquires a faint odor and taste; soluble in 13 parts of Alcohol; very soluble in boiling Alcohol and in Ether, Chloroform, Carbon Disulphide, and fixed or volatile oils.

IMPURITY.—Matters derived from coal tar.

INCOMPATIBLES.—Phenol and phenyl salicylate, when triturated dry; chromic acid.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

ACTION.

Antiseptic; antifermentative; disinfectant; deodorant; is a true intestinal antiseptic.

Uses.

Externally for ulcers, cancers and pus cavities; internally in dysentery and catarrhal, typhoid and tuberculous diarrhœa; also as a vermifuge.

II. BETANAPHTHOL.

BETANAPHTHOL. $C_{10}H_7OH = 142.98$. *Synonym.*—Naphthol. A monatomic phenol occurring in Coal Tar, but usually prepared from Naphthalene. It should be kept in dark amber-colored bottles.

Source.—Concentrated Sulphuric Acid is allowed to act on Naphthalene, whereby Betanaphthalenesulphonic Acid is formed ($C_{10}H_7HSO_3$). This acid is dissolved in water, saturated with Milk of Lime, and the resulting Calcium Salt separated by crystallization. The crystals are re-dissolved in water and decomposed by Sodium Carbonate, yielding Sodium Naphthalenesulphonate ($C_{10}H_7SO_3Na$). The Sodium Salt is next added to fused Sodium Hydroxide and Sodiumnaphthol, $C_{10}H_7ONa$, and Sodium Sulphite, $NaSO_3$, is formed. The former is treated with Hydrochloric Acid, yielding Betanaphthol and Sodium Chloride, and the Betanaphthol is purified by sublimation and re-crystallization from hot water.

Characters.—Colorless, or pale buff-colored, shining, crystalline laminæ, or a white or yellowish-white crystalline powder, having a faint phenol-like odor and a sharp and pungent but not persistent taste. *Solubility.*—In about 950 parts of water and about 75 of boiling water; in 0.61 part of Alcohol; very soluble in boiling Alcohol and in Ether, Chloroform, and solutions of alkali hydroxides.

Impurities.—Alpha-naphthol, naphthalene and other organic substances.

Incompatibles.—Antipyrine, camphor, exalgine, ferric chloride, menthol, phenol, potassium permanganate, urethane.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Action.

Antiseptic; irritant; in the course of excretion it irritates the bladder and urethra, and when injected subcutaneously, or absorbed from the alimentary canal in sufficient quantity, excites acute nephritis.

Uses.

Externally in skin diseases; internally in flatulent dyspepsia; dilated stomach; chronic gastric and intestinal catarrh; tuberculous ulceration of the bowels; typhoid fever; scarlatina; diphtheria; erysipelas; uncinariasis.

GROUP VII.

The Nitrogen-Benzene Derivatives.

Acetanilide, Exalgine, Acetphenetidin, Benzosulphinide.

I. ACETANILIDUM.

ACETANILIDE. $C_8H_9NO = 134.09$. *Synonyms.*—Phenylacetamide. Antifebrin. The monacetyl derivative $[C_6H_5NH(CH_3 \cdot CO)]$ of Aniline.

SOURCE.—Glacial Acetic Acid and pure Aniline are heated together, the excess of both ingredients is then distilled off, and the congealed residue is crude Acetanilide, which is purified by repeated crystallization from water. $C_6H_5NH_2 + HC_2H_3O_2 = C_6H_5NHC_2H_3O + H_2O$.

CHARACTERS.—Colorless, shining, micaceous, crystalline laminæ. or a crystalline powder, odorless, having a faintly burning taste, and permanent in the air. *Solubility.*—In 179 parts of water and 18 of boiling water; in 2.5 parts of Alcohol and in 0.4 part of boiling Alcohol; in 12 parts of Ether and 5 parts of Chloroform.

IMPURITIES.—Aniline salts and allied substances, antipyrine, acetphenetidin.

INCOMPATIBLES.—Alkaline bromides and iodides, chloroform, hydrated chloral, phenol, potassium and sodium hydroxides, resorcinol, spirit of nitrous ether, thymol.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Preparation.

Pulvis Acetanilidi Compositus.—Compound Acetanilide Powder. Acetanilide, 70; Caffeine, 10; Sodium Bicarbonate, 20.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

ACTION.

Antiseptic; hæmostatic; antipyretic; analgesic; diuretic; diaphoretic; depresses the heart; causes formation of methæmoglobin, and disintegration of red blood corpuscles; may induce skin eruptions. It is believed that acetanilide and other antipyretics of its class act through alterations produced in the heat-regulating mechanism which result in lowering the point at which the temperature is maintained. Consequently, a great increase in the dissipation of heat must take place in order to get rid of the warmth that has accumulated in the body, and this augmented output is attained by dilatation of the cutaneous blood-vessels. Their principal action practically, therefore, is by causing an increased heat loss through this vascular effect,

by reason of which a large amount of blood is exposed to the cold air.

Uses.

Externally, for venereal and other ulcerations, urticaria, eczema, erysipelas and other affections associated with considerable irritation, and as an antiseptic for wounds; internally, for the reduction of pyrexia and as an analgesic for neuralgias, dysmenorrhœa, locomotor ataxia, migraine, and various headaches. Several proprietary remedies containing acetanilide are used to a considerable extent. On account of the danger of collapse effects, it is now generally considered preferable to reduce the temperature in fevers, when this is desired, by cold baths and other means.

Toxicology.—Stimulation as in collapse from other causes. Alcohol; ether; strychnine; hot applications; inhalation of oxygen.

Unofficial Preparation.

II. Exalginum. — Exalgine. $C_6H_5N(CH_3)CH_3CO = 148.70$.

Synonym.—Methyl Acetanilide.

Source.—By warming together Monomethylaniline and Acetyl Chloride.

Characters.—Colorless acicular needles, with a slightly saline taste. *Solubility.*—In 60 parts of water; freely in Alcohol.

Dose, .03 to .20 gm.; ½ to 3 gr.

Action.

Has the general action of the antipyretics, but in medicinal doses rarely causes depression.

Uses.

It is an excellent analgesic, and not infrequently gives relief when other dugs have failed.

III. ACETPHENETIDINUM.

ACETPHENETIDIN. $C_{10}H_{13}NO_2 = 177.79$. *Synonyms.*—Para-acetphenetidin. Phenacetin. A phenol derivative [Acetparaphenetidin, $C_6H_4(OC_2H_5)\cdot NH\cdot CH_3CO$ 1 : 4], the product of the acetylization of Paraamidophenetol.

Source.—Glacial Acetic Acid is made to act upon Paraphenetidin, a product of Paranitrophenol. $C_6H_5OC_2H_5NH_2 + HC_2H_3O_2 = C_6H_4OC_2H_5NHC_2H_3O + H_2O$.

CHARACTERS.—White, glistening, crystalline scales, or a fine crystalline powder, odorless and tasteless. *Solubility.*—In 925 parts of water and 70 of boiling water; in 12 parts of Alcohol and 2 of boiling Alcohol; in 63 parts of Ether and 20 parts of Chloroform.

IMPURITIES.—Paraphenetidin, acetanilide.

INCOMPATIBLES.—Hydrated chloral, iodine, phenol, salicylic acid, oxidizers.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

ACTION.

A powerful antipyretic and analgesic, but less effective than acetanilide or antipyrine. Its effects, however, last longer, and as it depresses the heart but little, it is safer.

USES.

It is generally to be preferred as a remedy for the relief of pain, and it has been found of service in the treatment of epilepsy.

IV. BENZOSULPHINIDUM.

BENZOSULPHINIDE. Saccharin.—$C_6H_4\begin{matrix}SO_2\\ \diagup\diagdown\\ CO\end{matrix}NH$ = 181.77. The anhydride of Ortho-sulphamide-benzoic Acid (Benzoyl-sulphonicimide). *Synonyms.*—Anhydro-orthosulphamide-benzoic Acid. Glucusimide. Gluside.

SOURCE.—It is derived from Toluene, $C_6H_5CH_3$, a derivative of coal tar. The toluene is treated with concentrated Sulphuric Acid at 100° C. (212° F.), by which means there are formed Ortho- and Para-sulphonic Acids, which are first converted into Calcium salts, and then, by the use of Sodium Carbonate, into Sodium salts. From these a mixture of Ortho- and Para-toluenesulphochlorides is obtained by the action of Phosphorus Pentachloride; upon strongly cooling the mixture the paramodification crystallizes out, and is thus separated. From the other isomeric chloride Ortholuene-sulphamide is formed by means of dry Ammonia gas. This sulphamide is next oxidized with Potassium Permanganate, converting it into Potassium Ortho-sulphamine-benzoate, the solution of which is freed from precipitated Manganese Dioxide and decomposed by means of an acid; instead of separating as free Orthosulphamide-benzoic Acid, the later splits up into its anhydride and water. It is this Orthosulphamide-benzoic Anhydride which is known as Saccharin.

CHARACTERS.—A white, crystalline powder, nearly odorless and having an intensely sweet taste even in dilute solutions (1 of Saccharin being equal to 300 of cane sugar). *Solubility.*—In 250 parts of water and 24 of boiling

water; in 25 parts of Alcohol; but slightly soluble in Ether or Chloroform; easily soluble in Ammonia Water, in alkali hydroxide solutions, and in a solution of Sodium Bicarbonate, with the evolution of Carbon Dioxide.

IMPURITIES.—Glucose, milk-sugar, benzoic and salicylic acids, carbohydrates, inorganic impurities. Commercial Saccharin is not a pure or uniform product; it often contains less than 50 per cent. of actual Saccharin.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

ACTION.

Antiseptic.

USES.

As a sweetening agent in the place of sugar for diabetics and others to whom the use of sugar is interdicted; locally in aphthæ and ozæna; as an internal antiseptic in cystitis with ammoniacal urine.

GROUP VIII.

The Oxybenzoic Derivatives.

Orthoform, Di-iodosalicylic Acid.

Unofficial Preparations.

I. Orthoformum. — Orthoform. $C_6H_3(OH)(NH_2)COOCH_3$.

The Methyl Ester of Paraamidometaoxybenzoic Acid.

SOURCE.—From Benzoic Acid by synthesis.

CHARACTERS.—A bulky, colorless, odorless and tasteless powder.

Solubility.—Sparingly in water. Soluble in Alcohol or Ether.

INCOMPATIBLES.—Antipyrine, bismuth subnitrate, formaldehyde, mercury bichloride, potassium permanganate, silver nitrate, and zinc chloride.

ACTION.

Its effects on sensory and nerve terminations are similar to those of cocaine, but otherwise its action is different; the special feature of its anæsthetic influence is its long continuance. It produces an anæsthetic effect only when it comes into actual contact with exposed nerve-ends.

USES.

As a dusting powder or in ointments; it is not only very efficient in relieving pain where it can reach nerve terminations,

but also exerts a healing influence similar to that of iodoform. When applied to ulcers it has been known to produce sloughing such as is caused by pure carbolic acid, and on the skin to cause more or less decided irritation.

II. Acidum Di-Iodosalicylicum. — Di-iodosalicylic Acid. $C_6H_2I_2(OH)COOH$.

SOURCE.—Prepared by adding Iodine and Iodic Acid to an alcoholic solution of Salicylic Acid.

CHARACTERS.—A crystalline powder, of sweetish taste, melting at 220° to 230° C. (428° to 446° F.), with decomposition. *Solubility.*—In 1500 parts of water and 660 of boiling water; soluble in Alcohol and in Ether.

Di-iodosalicylic Acid contains 50 per cent. of Iodine.

Dose, .30 to 1.20 gm.; 5 to 20 gr.

ACTION.

Analgesic; antiseptic; antipyretic.

USES.

As a substitute for iodoform and as an internal antiseptic.

GROUP IX.

The Organic Bases.

Antipyrine, Pyramidon, Salipyrine, Iodol, Piperazine, Lycetol, Alpha-Eucaine Hydrochloride, Beta-Eucaine Hydrochloride.

I. ANTIPYRINA.

ANTIPYRINE. $C_{11}H_{12}N_2O = 186.75$. *Synonym.*—Phenazone. Phenyldimethylpyrazolon [$C_3NH_2O(CH_3)_2 \cdot C_6H_5$], obtained by the condensation of Phenylhydrazine with Aceto-acetic Ether, and methylation of the product.

SOURCE.—Aceto-acetic Ether is acted upon by Phenylhydrazine, when Phenylmonomethylpyrazolon, Ethyl Alcohol, and water are formed. $CH_3COCH_2COOC_2H_5 + H_2NNHC_6H_5 = C_6H_5(CH_3)C_3H_2N_2O + C_2H_5OH + H_2O$. The Monomethyl compound is dissolved in Methyl Alcohol and treated with Methyl Iodide. $C_6H_5(CH_3)C_3H_2N_2O + CH_3I = C_6H_5(CH_3)_2C_3HN_2O + HI$.

CHARACTERS.—A colorless, almost odorless, crystalline powder, or tabular crystals, with a slightly bitter taste. *Solubility.*—In less than 1 part of water, in 1 of Alcohol, 1 of Chloroform, and in 30 parts of Ether.

IMPURITIES.—Isonitroso-antipyrine, acetanilide, acetphenetidin.

INCOMPATIBLES.—Iron sulphate, iodide, and chloride, copper sulphate, alum, ammonia water, amyl nitrite, benzoates, lead subacetate, resorcinol, sodium bicarbonate, thymol, orthoform, urethane, iodine, arsenic iodide, carbolic, hydrocyanic and nitric acids, potassium permanganate, salicylates, calomel, mercuric chloride, spirit of nitrous ether; all preparations of tannin give a white precipitate; chloral decomposes it unless in dilute solution.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

ACTION.

Antiseptic; hæmostatic; antipyretic; diuretic; diaphoretic; in large doses it is a cardiac depressant and is said to produce convulsions, later coma, and paralysis of motor nerves and muscles. It is more apt to cause skin eruptions than acetanilide.

USES.

As a hæmostatic, antipyretic, anti-neuralgic, and anti-rheumatic; in chorea and epilepsy.

Toxicology.—Collapse effects are to be treated in the same way as those induced by acetanilide.

Unofficial Preparations.

II. Pyramidonum.—Pyramidon. *Synonyms.*—Dimethyl-amido-phenyl-dimethylpyrazolon. Dimethyl-amido-antipyrine. This is a derivative of Antipyrine in which an H atom of the pyrazolon group is replaced by a dimethyl-amido group.

SOURCE.—It is said to be formed by reducing Iso-nitroso-antipyrine, and methylating the product thus obtained.

CHARACTERS.—A yellowish-white crystalline powder, nearly tasteless, and soluble in 10 parts of water.

Dose, .25 to .50 gm.; 4 to 8 gr.

ACTION.

Resembles that of antipyrine, but more powerful, as well as more lasting in its effects. Pyramidon is less soluble and slower in action than antipyrine.

USES.

For the same purposes as antipyrine. Like results may be produced by it with about one-third the dose of the latter. It may be administered in capsule or in aromatic solution.

III. Salipyrina. — Salipyrine. $C_{11}H_{12}N_2O \cdot C_7H_6O_3$. *Synonym.*—Antipyrine Salicylate.

SOURCE.—Obtained by the action of Salicylic Acid upon Antipyrine, either at 100° C. or in solution.

CHARACTERS.—A colorless, odorless, coarsely crystalline powder, with a somewhat sweetish taste, and readily soluble in Alcohol and in Benzene.

Dose, .40 to 2 gm.; 6 to 30 gr.

ACTION.

Its action is that of its component constituents.

USES.

Employed in rheumatic affections, influenza, migraine and the various other conditions in which antipyrine and salicylic acid prove of service. It has been suggested that equally good results might be obtained from the administration of these two drugs in conjunction, in the proportion of about 2 to 3.

IV. IODOLUM.

IODOL. $C_4I_4 \cdot NH = 566.17$. *Synonym.*—Pyrroltetraiodide. It should be preserved in amber-colored bottles, protected from light.

SOURCE.—Tetraiodopyrrol, a derivative of the base Pyrrol, obtained by the direct action of Iodine upon the base in the presence of Alcohol.

CHARACTERS.—A light grayish-brown, crystalline powder, without odor or taste. *Solubility.*—In about 4900 parts of water, 9 of Alcohol, 1.5 of Ether, and 105 of Chloroform; soluble in fixed oils; also in concentrated Sulphuric Acid, producing a green solution gradually changing to brown.

IMPURITIES.—Free iodine, iodides, hydriodic acid, organic impurities.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

ACTION.

A cicatrizing agent with properties similar to those of iodoform, as a substitute for which it was first introduced.

USES.

Externally for the same purposes as iodoform. Internally it is sometimes given in the place of potassium iodide, and good results are alleged to have been obtained from it in tertiary syphilis, scrofula and diabetes.

Unofficial Preparations.

V. Piperazinum.—Piperazine. $C_4H_{10}N_2 = 85.9$. *Synonyms.*—Piperazidine. Dispermine.

SOURCE.—By the action of Ammonia on Ethylene Chloride. From the mixture of bases Diethylene Damine is separated by treating with excess of Sodium Nitrite at an elevated temperature; yielding Dinitrosopiperazine. After this is treated with acids or reducing agents Piperazine is obtained by distillation with alkalies.

CHARACTERS.—It occurs in colorless, well-defined, acicular crystals, readily soluble in water. In cold, aqueous solutions, it will dissolve twelve times as much Uric Acid as will Lithium Carbonate.

Dose, .50 to 1.00 gm.; 8 to 15 gr.

ACTION.

Diuretic; believed to slightly increase the amount of urea in the urine, while the uric acid is diminished; prevents decomposition by clearing the urine of pathological products, and thus far only is antiseptic.

USES.

Gout; goutiness (uricacidæmia); rheumatism.

VI. Lycetol. — Lycetol. $NH(CH_2CHCH_3)_2NH + H_2C_4H_4$. *Synonym.*—Dimethylpiperazine Tartrate. This is the tartrate of a substitution product from Piperazine, in which an atom of Hydrogen in each of two CH_2 groups is replaced by the Methyl group CH_3.

CHARACTERS.—A colorless powder with a pleasant acidulous taste, melting at 243° C., and readily soluble in water.

Dose, .90 to 1.80 gm.; 15 to 30 gr.

ACTION.

It is asserted that it is an active diuretic and that it exerts a powerful solvent influence upon uric acid, while causing no disturbance of digestion even when given continuously in large doses.

USES.

Gout and the so-called uric acid diathesis; cystitis; urinary calculi.

VII. Alpha-Eucainæ Hydrochloridum.—Alpha-Eucaine Hydrochloride. *Synonym.*—Alpha-Eucaine. $C_{19}H_{27}NO_4HCl + H_2O = 386.61$. The hydrochloride of a synthetic alkaloid having a close chemical relationship to cocaine.

SOURCE.—By the action of one molecule of Ammonia upon three molecules of Acetone, Triacetonamine is formed. This, by means of Hydrocyanic Acid, is transformed into Triacetonamencyanhydrine, and the latter is hydrolyzed by boiling with water. The benzoyl and methyl groups are then introduced by successive treatment with Benzoyl Chloride and Methyl Iodide, and the resultant product is Benzoyl-n-methyltetramethyl-y-oxypiperidinecarboxyilic-methylester, or the free base, Alpha-Eucaine. Finally this is crystallized out as the Hydrochloride.

CHARACTERS.—Permanent shining scales, easily powdered, containing one molecule of water of crystallization. *Solubility.*—In about 10 parts of water; more soluble in Alcohol.

INCOMPATIBLES.—Caustic alkalies, alkaline carbonates, ammonia.

ACTION.

Locally anæsthetic, like cocaine; its general action consists in a marked excitation of the entire central nervous system, followed by paralysis, which under toxic doses results in death. It is relatively safer, so far as circulation and respiration are concerned, than cocaine.

USES.

As a local anæsthetic. It was introduced as a substitute for cocaine, but owing to its causing ocular irritation and frequent toxic effects similar to those of cocaine, it has been superseded to a large extent by beta-eucaine.

VIII. Beta-Eucainæ Hydrochloridum.—Beta-Eucaine Hydrochloride.—$C_{15}H_{21}NO_2 \cdot HCl$. *Synonyms.*—Beta-Eucaine. Benzoylvinyldiacetonalkamine Hydrochloride.

SOURCE.—It is the Benzoyl derivative of Vinyldiacetonalkalmine.

CHARACTERS.—A colorless, neutral, crystalline powder. *Solubility.*—In 28 parts of water and 14 of Alcohol. It may be sterilized by boiling, without undergoing decomposition.

ACTION.

Locally anæsthetic. It appears to be fully as analgesic as alpha-eucaine, while only half as toxic. Over cocaine it has the advantages of affecting the heart, circulation and respiration much less markedly, and of not drying the corneal epithelium nor causing mydriasis or disturbed accommodation. On the

other hand, it has the disadvantage of causing hyperæmia, rather than anæmia, of mucous membranes when locally applied.

Uses.

Its field is the same as that of cocaine, but in medullary anæsthesia, while the after-effects seem no greater than with cocaine, the analgesia is not so uniform or so lasting. It is employed to a very considerable extent in ophthalmic practice. For the eye, 1 to 2 per cent. solutions are employed; for mucous surfaces, 2 to 5 per cent. solutions.

DIVISION III: SUBSTANCES DERIVED FROM THE VEGETABLE KINGDOM.

GROUP I.—Drugs Acting Chiefly on the Nervous System.

CLASS I.—DRUGS ACTING CHIEFLY ON THE CEREBRUM.

A. CEREBRAL DEPRESSANTS, OR SOPORIFICS.

Opium, Morphine, Apomorphine Hydrochloride, Heroine, Hops, Lactucarium.

OPIUM.

OPIUM.—*Synonym.*—Poppy.—The concrete, milky exudation obtained by incising the unripe capsules of *Papaver somniferum* Linné (Fam. *Papaveraceæ*), and yielding, in its normal, moist condition, not less than 9 *per cent.* of Crystallized Morphine, when assayed. *Habitat.*—Western Asia; cultivated.

Characters.—In irregular, flattened, more or less rounded masses of variable size, externally grayish-brown, covered with remnants of poppy leaves and with occasional fruits of a species of *Rumex;* more or less plastic when fresh, but becoming hard on keeping; internally dark brown, somewhat lustrous; odor strong, narcotic; taste bitter and characteristic.

Varieties.—The above is the official opium; but the following are met with in commerce, and may be used to prepare the alkaloids: (*a*) Constantinople Opium. Small lenticular masses, 120 to 240 gm. (¼ to ½ lb.) in weight, and enclosed in a poppy leaf, but without the *Rumex* seeds. Sometimes the terms Turkey and Levant Opium include this. (*b*) Egyptian Opium. Flat, more or less circular cakes, 5 to 7.5 cm. (two or three in.) in diameter, reddish hue internally, covered with a leaf externally. Persian,

Indian, English, French and German opiums are rarely met with in this country.

COMPOSITION.—(1) *Alkaloids.*—At least nineteen in number. Most are combined with Meconic Acid, some with Sulphuric Acid, and some are free. Some Morphine Salts, and Codeine are official. These two alkaloids and Narceine and Thebaine are important. The following are the alkaloids existing in Opium:

Morphine (2.5 to 22.8 per cent.).	Hydrocotarnine	in minute quantity.
Codeine (0.2 to 0.7 per cent.).	Laudanine	
Thebaine (0.15 to 1 per cent.).	Laudanosine	
Narcotine (1.3 to 10 per cent.).	Meconidine	
Narceine (0.1 to 0.7 per cent.).	Rhœadine	
Papaverine (1 per cent.).	Codamine	
Pseudomorphine (0.2 per cent.).	Gnoscopine	
Protopine, Oxynarcotine, Cryptopine — in minute quantity.	Lanthropine	
	Deuteropine (not known in pure state).	

Narcotine is more properly called Anarcotine. Apomorphine is an artificial alkaloid.

(2) *Neutral bodies.*—Two in number:

Meconin. Meconoiasin.

(3) *Organic acids.*—Two in number:

Meconic Acid Thebolactic Acid.

(4) *Water, about 16 per cent.*

(5) *Mucilage, resin, pectin, glucose, fats, essential oil, caoutchouc, odorous substances, and ammonium, calcium and magnesium salts.*

The following analysis shows how specimens vary:

Patna Opium 3.98 per cent. of Morphine, 6.36 per cent. of Anarcotine.
Smyrna " 8.27 " " " 1.94 " " "

IMPURITIES.—Water, stones, fruits, leaves, starch, gum, lead balls.

INCOMPATIBLES.—Ferric chloride gives a deep red color (due to Meconic Acid). Zinc, copper and arsenic salts, silver nitrate, lead acetate and subacetate, give precipitates of meconates, sulphate and coloring matters. All tannin-containing preparations precipitate codeine tannate. Fixed alkalies, their carbonates and ammonia precipitate morphine and anarcotine. The small amount of glucose in opium may cause it to explode when made into a pill with silver nitrate.

Dose, 0.100 gm. = 100 milligm. (1½ gr.).

OPII PULVIS.—Powdered Opium. Opium dried at a temperature not exceeding 85° C. (185° F.), and reduced to a very fine powder.

Powdered Opium, for pharmaceutical or medicinal purposes, when assayed, should yield not less than 12 nor more than 12.5 per cent. of Crystal-

lized Morphine. Powdered Opium of a higher percentage may be brought within these limits by admixture with Powdered Opium of a lower percentage, or powdered Sugar of Milk, in proper proportions.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Preparations.

1. Acetum Opii.—Vinegar of Opium. *Synonym.*—Black Drop. Powdered Opium, 100; Myristica, 30; Sugar, 200; Diluted Acetic Acid to 1000; by maceration and percolation.

Dose, 0.5 c.c. (8 ♏).

2. Emplastrum Opii.—Opium Plaster. Extract of Opium, 6; Water, 8; Adhesive Plaster, 90.

3. Extractum Opii.—Extract of Opium. Powdered Opium, 100; Water, Sugar of Milk, each, a sufficient quantity; by trituration, filtration and evaporation.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

4. Opium Deodoratum.—Deodorized Opium. *Synonym.*—Denarcotized Opium. Powdered Opium, 500; Purified Petroleum Benzin, a sufficient quantity. By maceration, decantation, filtration and drying. Opium Deodoratum should be kept in well-stoppered bottles, and, when assayed, should be found to yield not less than 12 per cent. nor more than 12.5 per cent. of Crystallized Morphine. Opium in coarser powder may be deodorized in the same manner.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

5. Pilulæ Opii.—Pills of Opium. Powdered Opium, 6.5; Soap, 2; water, a sufficient quantity to make 100 pills. Each pill contains .06 gm. (1 gr.) of Opium.

Dose, 1 pill.

6. Pulvis Ipecacuanhæ et Opii.—Powder of Ipecac and Opium. *Synonym.*—Dover's Powder. Powdered Opium, 10; Ipecac, 10; Sugar of Milk, 80.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

7. Tinctura Opii Camphorata.—Camphorated Tincture of Opium. Paregoric. Powdered Opium, 4; Benzoic Acid, 4; Camphor, 4; Oil of Anise, 4; Glycerin, 40; Diluted Alcohol, 950; by maceration and filtration.

Dose, 8 c.c. (2 fl. dr.).

Camphorated Tincture of Opium is used in Mistura Glycyrrhizæ Composita.

8. Trochisci Glycyrrhizæ et Opii.—Troches of Glycyrrhiza and Opium. Extract of Glycyrrhiza, 15; Powdered Opium, 0.5;

Acacia, 12; Sugar, 20 gm.; Oil of Anise, 0.2 c.c. To make 100 troches. Each troche contains about .005 gm. ($\frac{1}{12}$ gr.) of Opium.

OPIUM GRANULATUM.—Granulated Opium. Opium dried at a temperature not exceeding 85° C. (185° F.) and reduced to a coarse (No. 20) powder. When assayed it should yield not less than 12 per cent., nor more than 12.5 per cent. of Crystallized Morphine. Granulated Opium of a higher percentage may be brought within these limits by admixture, in proper proportions, with Granulated Opium of a lower percentage, powdered Sugar of Milk, or Acacia.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Preparations.

1. Tinctura Ipecacuanhæ et Opii.—Tincture of Ipecac and Opium. Tincture of Deodorized Opium, 1000; Fluidextract of Ipecac, 100; Diluted Alcohol, a sufficient quantity; to make 1000. By evaporation and filtration.

Dose, 0.5 c.c. (8 ♏).

2. Tinctura Opii.—Tincture of Opium. Laudanum. Granulated Opium (containing 12 to 12.5 per cent. of Crystallizable Morphine), 100; Alcohol, Water, Diluted Alcohol, each, a sufficient quantity; to make 1000. By maceration and percolation. Tincture of Opium, when assayed, should contain in 100 c.c. not less than 1.2 nor more than 1.25 gm. of Crystallized Morphine.

Dose, 0.5 c.c. (8 ♏).

3. Tinctura Opii Deodorati.—Tincture of Deodorized Opium. Granulated Opium (containing 12 to 12.5 per cent. of Crystallizable Morphine), 100; Purified Petroleum Benzin, 75; Alcohol, 200; Water to 1000. By percolation, evaporation and filtration.

Dose, 0.5 c.c. (8 ♏).

4. Vinum Opii.—Wine of Opium. *Synonym.*—Sydenham's Laudanum. Granulated Opium, 100; Saigon Cinnamon, 10; Cloves, 10; Alcohol, White Wine, each, a sufficient quantity; to make 1000. By maceration and filtration.

Dose, 0.5 c.c. (8 ♏).

It will be noticed that from *Extract of Opium* there is prepared Emplastrum Opii, and from the *Deodorized Tincture*, Tinctura Ipecacuanhæ et Opii.

The following non-official preparations are sometimes used: *Nepenthe*, of the same strength as Laudanum, *Liquor Opii Sedativus* (Battley's solution), which is about 50 per cent. stronger than Laudanum, *Acetum Opii Crocatum* (black drop), four times as strong as Laudanum, and *Tinctura Opii Ammoniata* (Scotch Paregoric), about two and one-half times as strong as the Camphorated Tincture.

The following list, in which the doses are arranged, may assist the student:

Name.	*Dose.*
—Extractum Opii	0.065 gm. (1 gr.).
—Opii Pulvis	
—Opium Deodoratum	
—Opium Granulatum	
—Pulvis Ipecacuanhæ et Opii	0.500 gm. (7½ gr.).
—Acetum Opii	0.5 c.c. (8 ♏).
—Tinctura Ipecac et Opii	
—Tinctura Opii	
—Tinctura Opii Deodorati	
—Vinum Opii	
—Tinctura Opii Camphorata	8 c.c. (2 fl. dr.).
—Pilulæ Opii	1 pill.
—Trochisci Glycyrrhizæ et Opii.	
—Emplastrum Opii	Externally.

MORPHINA.—Morphine. $C_{17}H_{19}NO_3 + H_2O = 300.92$. An alkaloid obtained from Opium.

SOURCE.—Opium is macerated with distilled water, and strained, the infusion is evaporated and filtered. To the filtrate Alcohol and Water of Ammonia are added, and the Morphine crystallizes out. To purify the crystals, they are boiled with Alcohol, the solution filtered, when hot, through Animal Charcoal, and set aside to crystallize.

CHARACTERS.—Colorless or white, shining rhombic prisms, or fine needles, or a crystalline powder, odorless, and having a bitter taste; permanent in the air. It loses all of its water of crystallization at 100° C. (212° F.). *Solubility.*—In 3330 parts of water, 100 of Lime Water, 168 of Alcohol, 4464 of Ether, 1800 of Chloroform, 113.5 of Amyl Alcohol, and 525 of Acetic Ether; soluble in 1040 parts of water at 80° C. (176° F.), and in 76 of Alcohol at 60° C. (140° F.); insoluble in Benzene.

IMPURITIES.—Codeine, narcotine, quinine, strychnine and various other alkaloids, acetanilide, meconic acid or meconates, ammonium salts.

INCOMPATIBLES.—(Also of all the salts of Morphine): Alkalies, tannic acid, potassium permanganate, borax, chlorates, ferric chloride, iodides, lead acetate and subacetate, magnesium oxide, spirit of nitrous ether, silver nitrate, mercuric chloride, gold and sodium chloride.

Dose, 0.010 gm. = 10 milligm. (⅙ gr.).

MORPHINÆ ACETAS.—Morphine Acetate. $C_{17}H_{19}NO_3C_2H_4O_2 + 3H_2O = 396.26$. The acetate ($CH_3COOH \cdot C_{17}H_{19}NO_3 + 3H_2O$) of the alkaloid Morphine. A minute quantity of free Acetic Acid should be kept with it to prevent decomposition.

SOURCE.—Morphine is precipitated with Ammonia from a solution of

the Hydrochloride. It is dissolved in Acetic Acid and water, and the neutral solution evaporated.

CHARACTERS.—A white, or yellowish-white, crystalline or amorphous powder, having a faintly acetous odor, and a bitter taste. *Solubility.*—In 2.25 parts of water, 21.6 of Alcohol, 480 of Chloroform, and 5.2 of Glycerin, at 25° C. (77° F.); in 2 parts of water at 80° C. (176° F.) and 2.5 of Alcohol at 60° C. (140° F.); insoluble in Ether.

IMPURITIES.—The impurities of the Acetate and Sulphate are the same as those of Morphine.

Dose, 0.015 gm. = 15 milligm. (¼ gr.).

MORPHINÆ HYDROCHLORIDUM.—Morphine Hydrochloride. $C_{17}H_{19}NO_3HCl + 3H_2O = 372.86$. Like other salts of Morphine, it should be kept in well-stoppered, amber-colored vials.

SOURCE.—(1) Take a cold concentrated watery solution of Opium, precipitate the Meconic acid and resins with Calcium Chloride. The solution contains Morphine Hydrochloride. (2) Evaporate the solution till it is solid, press to remove coloring matter, exhaust with boiling water, filter, and again evaporate and press; repeat this till the solution is nearly colorless. (3) Complete the decolorization by digesting with Charcoal. (4) Precipitate the Morphine with Ammonia and wash. (5) Dissolve in Hydrochloric Acid and crystallize out.

CHARACTERS.—White, silky, glistening needles, microcrystalline cubes, or a white crystalline powder, odorless, and having a bitter taste. *Solubility.*—In 17.2 parts of water and 42 of Alcohol at 25° C. (77° F.); in 0.5 part of water at 80° C. (176° F.) and 35.5 parts of Alcohol at 60° C. (140° F.); insoluble in Ether or Chloroform.

IMPURITIES.—Apomorphine, in addition to those of Morphine.

Dose, 0.015 gm. = 15 milligm. (¼ gr.).

MORPHINÆ SULPHAS.—Morphine Sulphate. $(C_{17}H_{19}NO_3)_2H_2SO_4 + 5H_2O = 752.83$. The sulphate $[SO_2(OH)_2 \cdot (C_{17}H_{19}NO_3)_2 + 5H_2O]$ of the alkaloid Morphine.

SOURCE.—Morphine is dissolved in boiling distilled water; diluted Sulphuric Acid is added to neutralization, and on cooling the Sulphate appears in crystals.

CHARACTERS.—White, feathery, acicular crystals of a silky lustre, or in cubical masses, odorless, and having a bitter taste. *Solubility.*—In 15.3 parts of water and 465 of Alcohol at 25° C. (77° F.); in 0.6 part of water at 80° C. (176° F.), and 187 parts of Alcohol at 60° C. (140° F.); insoluble in Ether or Chloroform.

Dose, 0.015 gm. = 15 milligm. (¼ gr.).

Preparation.

Pulvis Morphinæ Compositus.—Compound Powder of Morphine. *Synonym.*—Tully's Powder. Morphine Sulphate, 1.5; Camphor, 32; Glycyrrhiza, 33; precipitated Calcium Carbonate, 33.5; Alcohol, a sufficient quantity. By trituration.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Two solutions of Morphine Sulphate should be carefully distinguished: (1) The old U. S. P. Solution (1 to 480 of water), and (2) Magendie's (1 to 30 of water). Magendie's Solution, as prepared in France, is made from the acetate, and is somewhat weaker.

Action.

Probably has no action when applied to the unbroken skin, but from mucous membranes and raw surfaces it is absorbed, exerting a marked anodyne influence. Most of the secretions are diminished by opium, but the sweat appears to be increased from dilatation of the cutaneous vessels. It tends to produce nausea and vomiting and to impair digestion; it causes diminished intestinal peristalsis and constipation, and abolishes or mitigates abdominal pain when present. Large doses occasion slowing of the heart, with a full pulse, dilatation of the cutaneous vessels, and a sensation of warmth in the skin, which may be followed by itching or discomfort. It acts as a direct poison to the respiratory centre, and slowness of the breathing is a characteristic feature of its effects. Small doses stimulate the brain, while large doses depress the higher cerebral functions. The depression is usually preceded by a stage of excitement, but in some instances this is entirely lacking. Sooner or later the patient sinks into a sleep, which, unless the dose is quite large, is apt to be filled with dreams. Opium is not only a powerful hypnotic, but the most perfect analgesic known. Large doses usually cause depression of the conducting and reflex functions of the spinal cord. Contraction of the pupil is a constant effect. Metabolism is ordinarily lessened as a result of the quiet condition of the subject caused by the drug. Opium is excreted chiefly by the digestive tract and in the salivary, gastric and intestinal secretions, and it is found in large amount in the

fæces. Children are much more susceptible to its effects than adults, and certain individuals present a pronounced idiosyncrasy against the drug. The tolerance of opium by the system is remarkable, so that persons who use it habitually can take enormous doses. Morphine is more certain, as well as more prompt, in its anodyne and hypnotic effects, and is excreted more rapidly, than opium.

Uses.

It is constantly employed locally as an anodyne, but as the drug has no effect on sensory nerve terminations, any benefit that is derived from such applications must be due to adventitious circumstances or to absorption from wounds or mucous surfaces. Internally it is given for the relief of pain in all parts of the body (if this is acute, preferably in the form of morphine by hypodermatic injection), for diarrhœal affections, for peritonitis and other inflammations, and after operations or wounds of the abdomen. Small doses of morphine, administered subcutaneously, often act very happily in cardiac troubles. Opium is of great service as an internal hæmostatic, and is used in hæmoptysis, hæmatemesis and intestinal and other hæmorrhages. It is also employed with good effect in many affections of the respiratory system, and is a frequent constituent of expectorant mixtures. In delirium tremens and other forms of mania, and in various diseases of the nervous system, it has a limited use. Opium and its derivatives are acknowledged to have a favorable effect in many cases of diabetes; in Bright's disease the drug should be given with great caution. In surgical practice it has always been widely employed to prevent or mitigate shock, as well as to relieve pain and check or alleviate inflammation.

Toxicology.—The post-mortem appearances are those characteristic of asphyxia. *Treatment.*—Wash the stomach out repeatedly; emetics, especially apomorphine hydrochloride subcutaneously; potassium permanganate; atropine or belladonna; caffeine, especially in the form of strong black coffee; walk the patient about; flagellations; the faradic current; ammonia, oxygen or amyl nitrite by inhalation; ether hypodermatically;

external warmth; artificial respiration. *Chronic poisoning* is usually characterized by impaired appetite and digestion, constipation, loss of weight, anæmia, contracted pupils, dry tongue and skin, irregular heart action, muscular tremors, unsteady gait, and loss of energy and will-power; and the patient sinks into the most profound moral degradation. The treatment is attended with immense difficulties, and isolation is generally required.

CODEINA.—Codeine. $C_{18}H_{21}NO_3 + H_2O = 314.83$. *Synonym.*—Methyl Morphine. An alkaloid $[C_{17}H_{18}(CH_3)NO_3 + H_2O]$ obtained from Opium, or prepared from Morphine by methylation. Codeine and its salts should be kept in well-stoppered, amber-colored vials.

SOURCE.—Usually obtained by evaporating the ammoniacal liquids remaining after the precipitation of Morphine by Ammonia in the preparation of the Hydrochloride, treating the residue with water, precipitation with Potassium Hydroxide, and purifying by dissolving in Ether and letting the Codeine crystallize out on spontaneous evaporation.

CHARACTERS.—White, or nearly translucent, orthorhombic prisms, octahedral crystals, or a crystalline powder; odorless, and having a faintly bitter taste; slightly efflorescent in warm air. *Solubility.*—In 120 parts of water, 1.6 of Alcohol, 12.5 of Ether, and 0.66 part of Chloroform at 25° C. (77° F.); in 59 parts of water at 80° C. (176° F.), and in 0.92 part of Alcohol at 60° C. (140° F.).

IMPURITY.—Morphine.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

CODEINÆ PHOSPHAS.—Codeine Phosphate. $(C_{18}H_{21}NO_3)_3 \cdot H_3PO_4 + 2H_2O = 430$. The phosphate $[PO(OH)_3(C_{17}H_{18}(CH_3)NO_3 + 2H_2O]$ of an alkaloid obtained from Opium, or prepared from Morphine by methylation.

SOURCE.—Usually obtained by neutralizing a hot aqueous solution of Codeine with Phosphoric Acid, and allowing to crystallize.

CHARACTERS.—Fine, white, needle-shaped crystals, or a crystalline powder, without odor, and having a bitter taste. It frequently crystallizes with one and a half molecules of water of crystallization. *Solubility.*—In 2.25 parts of water, 261 of Alcohol, 1340 of Ether, and 6620 parts of Chloroform at 25° C. (77° F.); in 0.46 part of water at 80° C. (176° F.), and 97 of Alcohol at 60° C. (140° F.).

Dose, 0.030 gm. = 30 milligm. (½ gr.).

CODEINÆ SULPHAS. — $(C_{18}H_{21}NO_3)_2 \cdot H_2SO_4 + 5H_2O = 780.65$. The sulphate $[SO_2(OH)_2 \cdot (C_{17}H_{18}(CH_3)NO_3)_2 + 5H_2O]$ of an alkaloid obtained from Opium, or prepared from Morphine by methylation.

SOURCE.—Usually obtained by neutralizing a hot aqueous solution of Codeine with Sulphuric Acid, and allowing to crystallize.

CHARACTERS.—Long, glistening, white, needle-shaped crystals, rhom-

bic prisms, or a crystalline powder, efflorescing in the air, odorless, and having a bitter taste. *Solubility.*—In about 30 parts of water, and 1035 of Alcohol at 25° C. (77° F.); in 6.25 parts of water at 80° C. (176° F.), and 340 of Alcohol at 60° C. (140° F.); insoluble in Chloroform and Ether.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

Action.

It somewhat resembles morphine in the general character of its action, but while it is powerfully analgesic, it is much less toxic and its hypnotic influence is quite limited. It has a decidedly stimulating effect upon the spinal cord, the medulla, and the lower parts of the brain, and is much less constipating than morphine or opium.

Uses.

It is especially useful in relieving cough of all kinds, and is more efficient than opium in diabetes. It is often employed in cases where, as often happens in malignant disease, an anodyne effect must be maintained more or less continuously.

APOMORPHINÆ HYDROCHLORIDUM.—Apomorphine Hydrochloride. $C_{17}H_{17}NO_2HCl = 301.34$. The hydrochloride of an alkaloid prepared from Morphine by the abstraction of one molecule of water. It should be kept in small, dark amber-colored vials, which have been previously rinsed with Diluted Hydrochloric Acid and dried.

Source.—Obtained by heating Morphine in sealed tubes with an excess of Hydrochloric Acid. The Morphine loses one molecule of water, thus: $C_{17}H_{19}NO_3 = C_{17}H_{17}NO_2 + H_2O$.

Characters.—Minute, grayish-white monoclinic prisms, glistening, odorless, having a faintly bitter taste, and acquiring a greenish tint on exposure to light and air. *Solubility.*—In 39.5 parts of water, 38.2 of Alcohol, 1864 of Ether, and 3800 of chloroform at 25° C. (77° F.); in 16 parts of water at 80° C. (176° F.), and in 30 parts of Alcohol at 60° C. (140° F.).

Impurities.—Morphine, codeine, narceine, narcotine.

Dose, (expectorant) **0.002 gm. = 2 milligm.** ($\frac{1}{30}$ **gr.**); (emetic) **0.005 gm. = 5 milligm.** ($\frac{1}{10}$ **gr.**).

Action.

The most powerful emetic known, acting on the vomiting centre in the medulla; from the effect of the emesis caused by it there result increased respiration, pulse-rate, and blood-pressure;

apomorphine also produces a watery discharge from the vessels of the respiratory mucous membrane; it may cause collapse. but not of a fatal character.

Uses.

To procure prompt vomiting (usually administered by subcutaneous injection); as an expectorant (particularly useful in acute bronchitis, chronic dry bronchitis, chronic catarrhal pneumonia, and phthisis); as a hypnotic.

Unofficial Preparations.

Heroina.—Heroine, $C_{17}H_{17}NO_3\begin{cases}CH_3CO\\ \\ CH_3CO\end{cases}$. *Synonyms.*—Morphine Diacetic Ester. Diacetyl-Morphine.

Source.—Formed from Morphine by substituting Acetyl for its two hydroxyls.

Characters.—A colorless, odorless, crystalline powder, with a slightly bitter taste; insoluble in water, soluble in diluted acids.

Dose, .003 to .012 gm.; $\frac{1}{20}$ to $\frac{1}{5}$ gr.

Heroinæ Hydrochloridum.—Heroine Hydrochloride. [$C_{17}H_{17}(C_2H_3O_2)_2NOHCl = 402.62$]. A white crystalline powder, obtained by dissolving Heroine in dilute Hydrochloric Acid. The solution is then concentrated and allowed to crystallize. *Solubility.*—Soluble in Alcohol and in 2 parts of water.

Dose, .003 to .012 gm.; $\frac{1}{20}$ to $\frac{1}{5}$ gr.

Action.

It especially affects the respiratory functions, and has little analgesic or hypnotic influence.

Uses.

Employed particularly for controlling cough.

The following non-official alkaloids are sometimes used:—

Papaverine.—About 1 per cent. of this is contained in Opium. Colorless needles or prisms, slightly soluble in cold Ether or Alcohol, but readily soluble in hot Alcohol, Chloroform and Petroleum Benzin. Its action, though much feebler than either, is regarded as similar to that of both Morphine and Codeine.

Anarcotine.—This is also known as Narcotine, which is an improper name, for the drug does not cause sleep. It is contained in Opium 1.3

to 10 per cent., the amount varying greatly according to the source; it is the chief constituent of Indian Opium. It exists in a free state in Opium, from which it is left behind when the drug is treated with water. It crystallizes in white silky, flexible needles which are tasteless and odorless. It is antiperiodic in its action, and is valuable not only as a preventive but as a curative agent in malarial fevers.

Thebaine. Synonym.—Paramorphine. It is contained in Opium, 0.15 to 1 per cent. It occurs in silver scales or hard prisms, odorless and having a bitterish taste; soluble in Ether, Alcohol and Chloroform. It produces powerful convulsions as the result of its action on the cord. Its subsequent depressant action is very slight.

HUMULUS.

HOPS.—The carefully dried strobiles of *Humulus Lupulus* Linné (Fam. *Moraceæ*), bearing their natural glandular trichomes. *Habitat.*—Northern temperate zone; cultivated.

CHARACTERS.—Ovoid-cylindrical, about 3 cm. long, consisting of a thin, hairy flexuous rachis and numerous yellowish-green to pale brown obliquely-ovate, membranaceous scales with a glandular-hairy base, frequently infolded on one side, enclosing a subglobular, light brown, very glandular akene; odor strong and agreeable; taste aromatic and bitter.

COMPOSITION.—The chief constituents are—(1) *Lupulin.* (2) *Lupulinic Acid,* 11 per cent., a bitter crystalline principle. (3) *Valerol,* 1 per cent., an aromatic volatile oil giving the odor. (4) Resin, 9 to 18 per cent. (5) Tannic acid, 3 to 4 per cent.

INCOMPATIBLES.—Mineral acids, metallic salts.

Dose, 2 gm. (30 gr.).

LUPULINUM.—Lupulin. The glandular trichomes separated from the fruit of *Humulus Lupulus.*

CHARACTERS.—A granular powder, bright, brownish-yellow, becoming yellowish-brown, and resinous; its component trichomes somewhat globular or ellipsoidal, 0.1 to 0.3 mm. in diameter, multicellular; having the characteristic odor and taste of Hops.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparations.

1. Fluidextractum Lupulini.—Fluidextract of Lupulin. Lupulin, 1000; by maceration and percolation with Alcohol, evaporation and solution to 1000 parts.

Dose, 0.5 c.c. (8 ♏).

2. Oleoresina Lupulini.—Oleoresin of Lupulin. Lupulin, 500; by percolation with Acetone, and evaporation.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

ACTION.

Stomachic; Carminative; mildly sedative and narcotic.

USES.

Atonic dyspepsia; flatulent colic; diarrhœa; lupulin has been employed in nervous tremors, wakefulness and the delirium of drunkards. Hops are used medicinally chiefly in the form of malt liquors, and ale, stout or good beer may sometimes serve to improve the appetite and digestion and to secure sleep.

LACTUCARIUM.

LACTUCARIUM.—The concrete milk-juice of *Lactuca virosa* Linné (Fam. *Compositæ*). *Synonym.*—Lettuce. *Habitat.*—Southern and Central Europe.

CHARACTERS.—Usually in quarter sections of hemispherical masses, or in irregular, angular pieces; externally dull reddish-brown or grayish-brown; internally light brown or yellowish, of a waxy lustre and somewhat porous; odor distinct, opium-like; taste bitter. *Solubility.*—Partly soluble in Alcohol and in Ether.

COMPOSITION.—The chief constituents of Lactucarium are—(1) *Lactucerin or Lactucone*, $C_{16}H_{26}O$ about 50 per cent., a crystalline principle. (2) *Lactucin*, $C_{11}H_{12}O_3 + H_2O$, resembling mannite. (3) Lactucic Acid.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Syrupus Lactucarii.**—Syrup of Lactucarium. Tincture of Lactucarium, 100; Glycerin, 200; Orange Flower Water, 50; Citric Acid, 1. Add the Orange Flower Water, in which the Critic Acid has been previously dissolved, to the Tincture of Lactucarium and Glycerin, filter, if necessary, and add Syrup to 1000.

Dose, 8 c.c. (2 fl. dr.).

2. **Tinctura Lactucarii.**—Tincture of Lactucarium. Lactucarium, 500; Glycerin, 250; by treatment with Purified Petroleum Benzin and drying, then macerate and percolate with water, and Alcohol; evaporate, filter and add diluted Alcohol to 1000.

Dose, 2 c.c.; (30 ♏).

ACTION.

Mildly hypnotic.

USES.

It is unreliable as a hypnotic, but sometimes has the desired effect; the syrup is employed as a sedative addition to cough mixtures.

B. CEREBRAL EXCITANTS.

Belladonna, Atropine, Homatropine Hydrobromide, Stramonium, Hyoscyamus, Scopola, Indian Cannabis, Caffeine, Guarana, Theobromine Sodio-Salicylas.

BELLADONNA.

BELLADONNÆ FOLIA.—Belladonna Leaves. *Synonym.*—Deadly Night shade. The dried leaves of *Atropa Belladonna* Linné (Fam. *Solanaceæ*), yielding, when assayed, not less than 0.3 per cent. of mydriatic alkaloids. *Habitat.*—Europe and Asia Minor.

CHARACTERS.—Usually of a dull brownish-green color, the leaves much wrinkled and matted together, frequently with the flowering tops intermixed; leaves from 6 to 20 cm. long, 4 to 12 cm. broad, broadly ovate, apex acute, margin entire, narrowed into the petiole, upper surface brownish-green, lower surface grayish-green, epidermis more or less papillose, particularly on the under surface; odor distinctly narcotic, especially on moistening; taste somewhat bitter and acrid.

The powder is characterized by few hairs and numerous, small, arrow-shaped crystals of Calcium Oxalate.

Resembling Belladonna leaves.—Stramonium leaves, more wrinkled; hyoscyamus leaves, hairy.

COMPOSITION.—The chief constituents are—(1) *Atropine* (*see* p. 220). (2) So-called *Belladonnine*, a yellowish powder, is probably *identical with Hyoscyamine* (*see* p. 225). It has been stated that Atropine does not exist in Belladonna in the natural state, but that it is a conversion product of Hyoscyamine, which is the natural alkaloid of Belladonna. Atropine, Hyoscine (*see* p. 226), Daturine (*see* p. 224), Duboisine and Scopolamine, all derived from atropaceous plants, are nearly identical, and exist as malates in the plant.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Preparations.

1. **Emplastrum Belladonnæ.**—Belladonna Plaster. Extract of Belladonna Leaves, 300; Adhesive Plaster, 700. Melt the plaster on a water-bath; then add the extract of belladonna leaves and continue the heat, stirring constantly, until a homogeneous mass results.

2. **Extractum Belladonnæ Foliorum.**—Extract of Belladonna Leaves. By percolation with Alcohol and water, and evaporation.

Dose, 0.010 gm. = 10 milligm. ($\frac{1}{6}$ gr.).

Extract of Belladonna Leaves is contained in Pilulæ Laxativæ Compositæ and Pilulæ Podophylli, Belladonnæ et Capsici.

3. Tinctura Belladonnæ Foliorum.—Tincture of Belladonna Leaves. Belladonna Leaves, 100; Diluted Alcohol, to 1000. By maceration and percolation.

Dose, 0.5 c.c. (8 ♏).

4. Unguentum Belladonnæ.—Belladonna Ointment. Extract of Belladonna Leaves, 10; Diluted Alcohol, 5; Hydrous Wool-Fat, 20; Benzoinated Lard, 65.

BELLADONNÆ RADIX.—Belladonna Root. The dried root of *Atropa Belladonna*, yielding, when assayed, not less than 0.45 per cent. of mydriatic alkaloids. *Habitat.*—Central and Southern Europe, in woods.

CHARACTERS.—In cylindrical or somewhat tapering, longitudinally wrinkled pieces, 1 to 2.5 cm. thick, the bark somewhat incurved at the edges of roots which have been split before drying; externally pale brownish-gray, dusty or mealy, outer layers of the periderm rather soft, frequently abraded, and thus showing lighter patches; fracture nearly smooth, mealy, and emitting a characteristic puff of dust; internally whitish, the older roots showing medullary rays near the bark; nearly inodorous; taste sweetish, afterwards bitterish and strongly acrid.

The powder contains relatively few sclerenchymatous fibres and numerous starch grains which are single or 2- to 3-compound, somewhat spherical, and 0.005 to 0.010 mm. in diameter.

COMPOSITION.—As of the leaves.

Dose, 0.045 gm. = 45 milligm. (¾ gr.).

Preparations.

1. Fluidextractum Belladonnæ Radicis.—Fluidextract of Belladonna Root. By percolation with Alcohol and Water, and evaporation.

Dose, 0.05 c.c. (1 ♏).

2. Linimentum Belladonnæ.—Belladonna Liniment. Camphor, 50; Fluidextract of Belladonna Root to 1000.

ATROPINA.—Atropine. $C_{17}H_{23}NO_3 = 287.04$. An Alkaloid obtained from *Atropa Belladonna* and from other plants of the same family. As it occurs in commerce, it is usually accompanied by a small proportion of Hyoscyamine, from which it cannot be readily separated.

SOURCE.—Atropine is made from the root thus:—(1) Make a tincture of the root by maceration and percolation with Alcohol. (2) Add slaked lime; this splits up the Atropine Malate, Lime Malate being precipitated. (3) Filter, and add Sulphuric Acid to precipitate the excess of Lime. (4) Filter, concentrate by distillation, partially evaporate, add Potassium Carbonate; after six hours much coloring matter is precipitated. (5) Filter,

add more Potassium Carbonate; this sets free the Atropine. (6) Shake up with Chloroform, which takes up the Atropine in solution. (7) Withdraw the Chloroform, evaporate, and Atropine is left. It is purified by digestion with warm Alcohol and Animal Charcoal.

CHARACTERS.—White, rhombic prisms, more or less elongated in the direction of the major axis, as they contain more or less Hyoscyamine; odorless, and possessing a bitter taste (*it should be tasted with the utmost caution, and only in dilute solution*). *Solubility.*—In 450 parts of water, 1.46 of Alcohol, 16.6 of Ether, and 1.56 of Chloroform; in 86.7 parts of water at 80° C. (176° F.) and in 0.9 part of Alcohol at 60° C. (140° F.). It can be decomposed into Tropine and Tropic Acid, and reconstructed by their synthesis. It is distinguished from Hyoscyamine, with which it is isomeric, by its melting-point, optical properties and molecular constitution.

IMPURITIES.—Hyoscine, hyoscyamine, morphine, strychnine and other alkaloids, readily carbonizable organic impurities.

INCOMPATIBLES.—Caustic alkalies decompose it. Common to all alkaloids: Alkalies and their carbonates, benzoates, borax, bromides, cyanides, salts of gold or mercury, ichthyol, iodides, oxalic, picric and tannic acids, oxidizers (chlorates, chromates, hydrogen dioxide, permanganates, etc.), vegetable decoctions and infusions. *Physiological Incompatibles.*—Aconitine, hydrated chloral, hydrocyanic acid, morphine, muscarine, physostigmine, phytolacca, pilocarpine, quinine.

Dose, 0.0004 gm.=0.4 milligm. ($\frac{1}{150}$ gr.).

Preparation.

Oleatum Atropinæ.—Oleate of Atropine. Atropine, 2; Alcohol, 2; Oleic Acid, 50; Olive Oil to 100. By trituration, solution and evaporation.

ATROPINÆ SULPHAS.—Atropine Sulphate. $(C_{17}H_{23}NO_3)_2H_2SO_4$, or $SO_2(OH)_2 \cdot (C_{17}H_{23}NO_3)_2 = 671.43$. As it occurs in commerce, it is usually accompanied by a small amount of Hyoscyamine Sulphate, from which it cannot be readily separated.

SOURCE.—Dissolve Atropine in Diluted Sulphuric Acid, treat with Ether; the insoluble Sulphate is deposited.

CHARACTERS.—A white crystalline powder or microscopical needles and prisms (the form of the latter being probably due to the Hyoscyamine present), odorless, and having a very bitter, nauseating taste, and permanent in the air. *Solubility.*—In 0.38 part of water, 3.7 parts of Alcohol, 2140 of Ether, and 620 of Chloroform at 25° C. (77° F.); in 0.22 part of water at 80° C. (176° F.) and 1.9 of Alcohol at 60° C. (140° F.).

Dose, 0.0004 gm.=0.4 milligm. ($\frac{1}{150}$ gr.).

Action.

Locally, anæsthetic and anodyne; applied to the conjunctiva, it is a typical mydriatic. Internally, its dominant and characteristic action is a depression of the terminations of most varieties of nerves. It therefore tends to inhibit the various secretions, but as with some of them the nervous influence is not so important as in the case of others, the secretions are not all affected to the same extent. That of saliva may be entirely arrested, and the secretion of the glands of the throat, nose and respiratory passages also stopped; so that dryness of the mouth and throat, hoarseness of the voice, thirst and difficulty of swallowing are produced. The skin likewise becomes dry, and the gastric, pancreatic, biliary, intestinal and urinary secretions are all more or less affected. The innervation of all unstriped muscle appears to be depressed or paralyzed. As the intestinal muscle, however, like other involuntary muscles, is capable of maintaining a regular movement independently of nervous impulses from without, irritating substances will cause peristalsis after the drug; so that the action of purgatives is not interfered with by it. Wide dilatation of the pupil and loss in the power of accommodation are caused by paralysis of the terminations of the motor oculi nerve. The heart-beat is accelerated from paralysis of the inhibitory terminations of the vagus; large amounts weaken and depress the cardiac muscle. A considerable rise in blood-pressure is caused in part by the acceleration of the heart and largely also by stimulation of the vaso-constrictor centre in the medulla; under toxic doses the pressure falls very low. The respiratory centre is stimulated; but large doses depress this, and in fatal cases death results from failure of the respiration. The action on the central nervous system consists of a true stimulation, followed by depression, and, if the amount is sufficient, paralysis. The drug acts chiefly on the motor divisions of the cerebrum. It is likely to cause restlessness, vertigo, staggering gait, chorea-like movements, emotional excitement, a busy delirium, and mania; in the subsequent paralytic stage, drowsiness, coma and convulsions may occur. The medulla and spinal

cord are involved, but in the cord the action is very much weaker than that of strychnine, and appears much later. A considerable rise in temperature is sometimes caused; excretion takes place principally by the kidneys. Children are less susceptible to the effects of belladonna than adults.

Uses.

Locally, to relieve pain of all kinds; to relax spasm; to promote the resolution of enlarged glands; to check sweating, suppuration, and the secretion of milk; atropine is used extensively in ophthalmological practice. Internally, to check mercurial and other ptyalism; night-sweats of phthisis and other abnormal perspirations; serous diarrhœa; intestinal, hepatic and renal colic; to prevent the griping of purgatives; with opium in peritonitis; painful gastric affections; vomiting; sick-headache due to or accompanied by spasm of the arterioles; cardiac disease; shock and collapse; acute coryza; whooping-cough and other spasmodic affections of the respiratory passages; mastitis; incontinence of urine; seminal emissioms; vesical spasm; chordee; scarlatina when the rash is imperfectly developed; the low, muttering delirium of typhoid and typhus fevers; certain forms of delirium tremens; sciatica and neuralgia; epilepsy. In many conditions atropine is most advantageously administered by hypodermatic injection and belladonna by suppository. The smoke of belladonna leaves is inhaled for asthmatic attacks.

Toxicology.—Wash out the stomach or give emetics; pilocarpine by hypodermatic injection; chloroform or ether, if necessary, to control spasms; ice to the head; stimulants subcutaneously; strong coffee by the rectum; external warmth; artificial respiration. The effects on the eye may be counteracted by the local use of physostigmine, as well as by pilocarpine.

HOMATROPINÆ HYDROBROMIDUM. — Homatropine Hydrobromide, $C_{16}H_{21}NO_3 \cdot HBr = 353.49$. The hydrobromide ($HBr \cdot C_{16}H_{21}NO_3$) of an alkaloid obtained by the condensation of Tropine and Mandelic Acid.

Characters.—A white, odorless, crystalline powder, or rhombic prisms, having a bitter taste. *Solubility.*—In 5.7 parts of water, 32.5 of Alcohol, and 620 parts of Chloroform; in 8.7 parts of Alcohol at 60° C. (140° F.); insoluble in Ether.

IMPURITIES.—Atropine, hyoscine, hyoscyamine and other alkaloids.
Dose, 0.0005 gm.=0.5 milligm. ($\frac{1}{120}$ **gr.**).

ACTION.

Similar in general to that of atropine, though it has the effect of slowing, instead of accelerating, the action of the heart, and is less poisonous.

USES.

To dilate the pupil in ophthalmic practice; the mydriasis lasts only about one-quarter the time of that produced by atropine.

STRAMONIUM.

STRAMONIUM.—*Synonyms.*—Thorn apple. Stinkweed. Jamestown Weed. The dried leaves of *Datura Stramonium* Linné (Fam. *Solanaceæ*), yielding, when assayed, not less than 0.25 per cent. of mydriatic alkaloids. *Habitat.*—Asia; naturalized in most countries.

CHARACTERS.—Usually of a dark green or grayish-green color, much wrinkled and matted together; petiolate, 6 to 20 cm. long, inequilaterally ovate, acuminate, very oblique at the base, the large teeth few, acute, with rounded sinuses; thin, brittle; odor distinct, heavy and narcotic; taste nauseous.

The powder contains few hairs and has numerous rosette-shaped Calcium Oxalate crystals from 0.010 to 0.020 mm. in diameter.

Resembling Stramonium Leaves.—Belladonna leaves, but less wrinkled; Hyoscyamus leaves, hairy.

COMPOSITION.—The chief constituents are—(1) *Daturine* (.02 to .03 per cent.), which resembles Atropine but is probably identical with Hyoscyamine. Usually a little Atropine is present, and the term daturine is occasionally applied to the total alkaloids of Stramonium. (2) A fixed oil (25 per cent.), which contains *Daturic Acid*, $C_{17}H_{34}O_2$.

INCOMPATIBLES.—Caustic alkalies, metallic salts, mineral acids.

Dose, 0.065 gm.=65 milligm. (1 **gr.**).

Preparations.

1. **Extractum Stramonii.**—Extract of Stramonium. By evaporation of the Fluidextract to a pilular consistence.

Dose, 0.010 gm.=10 milligm. ($\frac{1}{6}$ **gr.**).

2. **Fluidextractum Stramonii.**—Fluidextract of Stramonium. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 0.05 c.c. (1 ♏).

3. Tinctura Stramonii.—Tincture of Stramonium. Stramonium, 100; Diluted Alcohol, by maceration and percolation to 1000.

Dose, 0.5 c.c. (8 ♏).

4. Unguentum Stramonii.—Stramonium Ointment. Extract of Stramonium, 10; Diluted Alcohol, 5; Hydrous Wool-Fat, 20; Benzoinated Lard, 65.

Action.

Like that of belladonna, though it appears to be more poisonous and to relax the bronchial muscle more completely.

Uses.

Principally to relieve the spasm of the bronchial tubes in asthmatic attacks; as a local anodyne.

HYOSCYAMUS.

HYOSCYAMUS.—*Synonym.*—Henbane. The dried leaves and flowering tops of *Hyoscyamus niger* Linné (Fam. *Solanaceæ*), collected from plants of the second year's growth, and yielding, when assayed, not less than 0.08 per cent. of mydriatic alkaloids. *Habitat.*—Europe and Asia; naturalized in some parts of North America.

Characters.—Leaves ovate, or ovate-oblong, the lower with a short petiole, the upper sessile, 5 to 25 cm. long, 2 to 10 cm. broad, acute, coarsely and angularly toothed or lobed, grayish-green, glandular-hairy, particularly on the lower surface; flowers nearly sessile, with an urn-shaped, unequally 5-toothed calyx and a campanulate corolla, which in the fresh state is yellowish, purple-veined; fruit capsular, 2-celled, and enclosed in the calyx; odor heavy, narcotic; taste somewhat bitter and nauseous. The powder is grayish-green and contains Calcium Oxalate in single or twin monoclinic prisms about 0.010 mm. in diameter.

Composition.—The chief constituents are—(1) *Hyoscyamine*, $C_{17}H_{23}NO_3$, an alkaloid. It is very closely allied to the active alkaloids of Belladonna and Stramonium (*see* p. 224) and is also contained in many plants of the natural order *Solanaceæ*. It, like Atropine, with which it is isomeric, consists of Tropic Acid and Tropine. There is in commerce an amorphous impure Hyoscyamine, which is a dark brown extract-like fluid having a disagreeable odor. As it is much cheaper than the crystalline alkaloid, it is often used, but this as well as other specimens should be proscribed. (2) *Hyoscine* (*see* below), a white crystalline alkaloid. It is stated to be the same as *Scopolamine* (*see* Scopola). Only its salts are used.

Incompatibles.—Vegetable acids, silver nitrate, lead acetate, alkalies.

Dose, 0.250 gm.=250 milligm. (4 gr.).

Preparations.

1. **Extractum Hyoscyami.**—Extract of Hyoscyamus. By evaporation of the Fluidextract to a pilular consistence. It should contain 0.3 per cent. of mydriatic alkaloids.

Dose, 0.065 gm.=65 milligm. (1 gr.).

Extract of Hyoscyamus is contained in Pilulæ Catharticæ Vegetabiles.

2. **Fluidextractum Hyoscyami.**—Fluidextract of Hyoscyamus. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 0.2 c.c. (3 ♏).

3. **Tinctura Hyoscyami.**—Tincture of Hyoscyamus. Hyoscyamus, 100; diluted Alcohol to 1000. By maceration and percolation.

Dose, 1 c.c. (15 ♏).

HYOSCINÆ HYDROBROMIDUM. — Hyoscine Hydrobromide. $C_{17}H_{21}NO_4HBr + 3H_2O = 434.92$. The Hydrobromide ($HBr \cdot C_{17}H_{21}NO_4 + 3H_2O$) of an alkaloid, chemically identical with Scopolamine, obtained from Hyoscyamus and other plants of the *Solanaceæ*.

SOURCE.—Most simply obtained by neutralizing the mother-liquors from the seed of Hyoscyamus and Stramonium remaining, after their removal of Hyoscyamine, with Hydrobromic Acid and adding Absolute Alcohol, when, after the lapse of some time crystals of Hyoscine Hydrobromide will separate, and may be purified by recrystallization from hot Alcohol.

CHARACTERS.—Colorless, transparent, rhombic crystals, sometimes of large size, odorless, and having an acrid, slightly bitter taste; slightly efflorescent. *Solubility.*—In 1.5 parts of water, 16 of Alcohol, and 750 of Chloroform; in 1.33 parts of Alcohol at 60° C. (140° F.); insoluble in Ether.

Dose, 0.0005 gm.=0.5 milligm. ($\frac{1}{120}$ gr.).

HYOSCYAMINÆ HYDROBROMIDUM. — Hyoscyamine Hydrobromide. $C_{17}H_{23}NO_3HBr = 367.40$. The hydrobromide ($HBr \cdot C_{17}H_{23}NO_3$) of an alkaloid obtained from Hyoscyamus and other plants of the *Solanaceæ*.

SOURCE.—Prepared by dissolving 10 parts of Hyoscyamine in 11 parts of 25 per cent. Hydrobromic Acid, evaporating the solution, and crystallizing.

CHARACTERS.—Write, prismatic crystals, or a yellowish, amorphous, resin-like mass, having, particularly when damp, a tobacco-like odor and an acrid, nauseous, and bitter taste; deliquescent on exposure to the air. *Solubility.*—Very soluble in water; soluble in 2 parts of Alcohol, 1600 of Ether and 2.5 of Chloroform.

IMPURITIES.—Atropine, morphine and other alkaloids, carbonizable impurities.

Dose, 0.0005 gm.=0.5 milligm. ($\frac{1}{120}$ **gr.**).

HYOSCYAMINÆ SULPHAS. — Hyoscyamine Sulphate. $(C_{17}H_{23}NO_3)_2H_2SO_4 = 671.43$. The neutral sulphate $[SO_2(OH)_2 \cdot (C_{17}H_{23}NO_3)_2]$ of an alkaloid prepared from Hyoscyamus and other plants of the *Solanaceæ*.

SOURCE.—Hyoscyamus is treated with Ether, to remove fat, then with Alcohol acidulated with Sulphuric Acid and distilled. The aqueous residue is neutralized with Soda, and the liquid precipitated with Tannic Acid, the precipitate mixed with Lime, then exhausted by strong Alcohol. The Alcoholic solution is treated with Sulphuric Acid, then with Soda, and finally with Ether, which dissolves the alkaloid, which is obtained from it by distillation.

CHARACTERS.—White, indistinct crystals, or a white powder, odorless, and having a bitter, acrid taste; deliquescent when exposed to the air. *Solubility.*—Very soluble in water; soluble in 6.4 parts of Alcohol, 2500 of Ether, and 2300 of Chloroform.

IMPURITIES.—Atropine and other alkaloids, carbonizable impurities.

Dose, 0.0005 gm.=0.5 milligm. ($\frac{1}{120}$ **gr.**).

ACTION.

Similar to that of belladonna, but the stimulation of the central nervous system is much shorter, and in some instances drowsiness and sleep are produced without any preliminary excitement. Both hyoscyamine and hyoscine are powerful hypnotics. Hyoscine produces mydriasis and loss of accommodation more quickly than atropine, but for a shorter period.

USES.

Principally to prevent the griping of purgatives and to relieve vesical spasm. The two alkaloids are used as hypnotics to a considerable extent, and especially in hospitals for the insane; hyoscine is the less dangerous of the two. Hyoscine is also employed in ophthalmic practice.

SCOPOLA.

SCOPOLA.—The dried rhizome of *Scopola Carniolica* Jacquin (Fam. *Solanaceæ*), yielding, when assayed, not less than 0.5 per cent. of its alkaloids.

CHARACTERS.—Of horizontal growth, more or less curved and shortly and sharply flexuous, cylindraceous and somewhat flattened vertically, occurring mostly in pieces from 2.5 to 7.5 cm. long and 0.8 to 1.6 cm. broad,

often split before drying; upper surface marked with closely set, large, cup-shaped stem scars, margins irregularly contracted; externally varying from yellowish-brown to dark brownish-gray, finely and irregularly wrinkled longitudinally, obscurely annulate and more or less nodular-roughened fracture short and sharp, exhibiting a yellowish-white bark, its corky layer dark brown, or pale brown, wood indistinctly radiate, and central pith rather horny; nearly inodorous; taste sweetish; afterwards bitterish and strongly acrid.

Dose, 0.045 gm.=45 milligm. (¾ gr.).

Preparations.

1. Extractum Scopolæ.—Extract of Scopola. By evaporating the Fluidextract to a pilular consistence.

Dose, 0.010 gm.=10 milligm. (⅙ gr.).

2. Fluidextractum Scopolæ.—Fluidextract of Scopola. By percolation and maceration with Alcohol and water, and evaporation.

Dose, 0.05 c.c. (1 ♏).

SCOPOLAMINÆ HYDROBROMIDUM. — Scopolamine Hydrobromide. $C_{17}H_{21}NO_4 \cdot HBr + 3H_2O = 434.92$. The hydrobromide [$HBr \cdot C_{17}H_{21}NO_4 + 3H_2O$] of an alkaloid obtained from plants of the *Solanaceæ;* chemically identical with Hyoscine Hydrobromide (*see* p. 226).

Dose, 0.0005 gm.=0.5 milligm. ($\frac{1}{120}$ gr.).

ACTION.

Mydriatic; analgesic: hypnotic: it markedly diminishes the secretion of saliva and sweat. Scopolamine is regarded as identical with hyoscine.

USES.

Hyperidrosis; ptyalism; glaucoma. Scopolamine is employed in ophthalmological practice and by hypodermatic injection in hospitals for the insane.

CANNABIS INDICA.

INDIAN CANNABIS. *Synonym.*—Indian Hemp. The dried flowering tops of the pistillate plants of *Cannabis sativa* Linné (Fam. *Moraceæ*), grown in the East Indies, and gathered while the fruits are still undeveloped, and carrying the whole of their natural resin. *Habitat.*—Asia; collected in India.

CHARACTERS.—In dark green or more or less brownish compressed masses, consisting of the densely paniculate branchlets, about 5 cm. or

more in length, and the inflorescence more or less agglutinated with a resinous exudation; commonly with a few undeveloped digitate leaves or one or more linear-lanceolate leaflets; clothed with numerous sheathing, pointed bracts, each containing two small mature but unfertilized pistillate flowers; odor agreeably narcotic; taste characteristic.

COMPOSITION.—The chief constituents are—(1) *Cannabinon*, a soft resin. (2) *Choline*, $C_5H_{15}NO_2$, which is contained in (3) *Tetanocannabine*, and with alkalies gives (4) *Cannabinine*. (5) *Cannabin*, a brown, amorphous resin, said to be very active.

INCOMPATIBLES.—Water (which precipitates the resin), caustic alkalies.

Dose, 0.065 gm.=65 milligm. (1 gr.).

Preparations.

1. **Extractum Cannabis Indicæ.**—Extract of Indian Cannabis. By maceration and percolation with Alcohol, and evaporation.

Dose, 0.010 gm.=10 milligm. ($\frac{1}{6}$ gr.).

2. **Fluidextractum Cannabis Indicæ.**—Fluidextract of Indian Cannabis. By maceration, percolation with Alcohol, which is distilled off, and evaporation.

Dose, 0.05 c.c. (1 ♏).

3. **Tinctura Cannabis Indicæ.**—Tincture of Indian Cannabis. Indian Cannabis, 100; Alcohol, by maceration and percolation, to 1000.

Dose, 0.6 c.c. (10 ♏).

Synonyms.—Haschisch is a confection of the drug. Gunjah, or Ganga, is the dried flowering tops of the cultivated female plants which are coated with resin. Churrus, or Charas, is the resin scraped off the leaves. Bhang, or Siddhi, is the dried leaves and stalks made with preserved fruits into a confection. In some provinces it means powdered Ganga made into a drink. Ganga and Charas are often smoked like tobacco.

ACTION.

Principally on the cerebrum, and it is probably the most powerful stimulant of the psychic functions known. Depression is mixed with the stimulation, and under its influence the patient passes into a dreamy, semi-conscious state, in which, while the judgment is practically lost, the imagination runs riot. The general sensibility is much diminished, and this effect may deepen into complete anæsthesia. Eventually, there usually results a tranquil sleep. In man the heart is generally accelerated by the inhalation of the drug.

USES.

Migraine; neuralgia; biliary colic; it is unreliable as a hypnotic.

CAFFEINA.

CAFFEINE. $C_8H_{10}N_4O_2 + H_2O = 210.64$. *Synonyms.* — Theine. Guaranine. A feebly basic substance, $[C_5H(CH_3)_3N_4O_2 + H_2O]$ obtained from the dried leaves of *Thea sinensis* Linné (Fam. *Ternstræmiaceæ*), or from the dried seed of *Coffea arabica* Linné (Fam. *Rubiaceæ*); found also in other plants. *Habitat.*—Tropical Africa; cultivated in tropical countries.

SOURCE.—Exhaust bruised coffee by successive portions of boiling water, precipitate with Lead Acetate, decompose the excess of Lead Acetate in the filtrate by Hydrogen Sulphide, concentrate by evaporation, neutralize with Ammonia. The Caffeine crystallizes on cooling, and is purified by re-dissolving in water, treating with Animal Charcoal, and evaporation. Commercially it is prepared almost exclusively from tea and tea dust or sweepings.

CHARACTERS.—White, flexible, silky glistening needles, usually matted together in fleecy masses, odorless, and having a bitter taste. *Solubility.*—In 45.6 parts of water, 53.2 of Alcohol, 375 of Ether, or 8 of Chloroform. Tea contains 3 to 5 per cent. (hence the name Theine). Coffee, 1.3 per cent. (coffee leaves contain much more). Guarana (the seeds of *Paullinia Cupana*), 4 to 5 per cent. (hence the name Guaranine). Maté (Paraguay tea, the leaves of *Ilex paraguayensis*), 1.2 per cent. Kola nut (which is used as a beverage in Africa), 3 per cent.; this is the fruit of *Sterculia acuminata*. Caffeine is trimethyl-xanthine, Theobromine is dimethyl-xanthine, and both can be prepared synthetically from xanthin.

Strictly speaking, Theine is the alkaloid of tea-leaves. It differs from Caffeine in that it is analgesic and constipates. Much of the Caffeine in the market is really Theine.

IMPURITIES.—Other alkaloids, organic impurities.

INCOMPATIBLES.—Potassium iodide, mercury salts, tannic acid. *Physiological Incompatibles.*—Hydrated chloral, morphine, physostigmine.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Caffeina is contained in Pulvis Acetanilidi Compositus.

Preparations.

1. **Caffeina Citrata.**—Citrated Caffeine. Dissolve Citric Acid, 50, in hot Distilled Water, 100; add the Caffeine, 50, and evaporate the resulting solution on a water-bath to dryness, constantly stirring towards the end of the operation. Reduce the product to a fine powder.

CHARACTERS.—A white powder, odorless, and having a slightly bitter, acid taste, and acid reaction. *Solubility.*—One part of Citrated

Caffeine forms a clear, syrupy solution with about 4 parts of hot water. It is also soluble in a mixture of equal volumes of Chloroform and Alcohol.

IMPURITY.—Tartaric acid.

Dose, 0.125 gm.=125 milligm. (2 gr.).

2. Caffeina Citrata Effervescens.—Effervescent Citrated Caffeine. Caffeine, 40; Citric Acid, 195; Sodium Bicarbonate, 570; Tartaric Acid, 300. Powder the Citric Acid and mix it intimately with the Citrated Caffeine and Tartaric Acid, then thoroughly incorporate the Sodium Bicarbonate. Place the mixed powders on a plate of glass or in a suitable dish, in an oven heated to between 93° and 104° C. (199.4° and 219.2° F.). When the mixture, by the aid of careful manipulation with a wooden spatula, has acquired a moist consistence, rub it through a No. 6, tinned-iron sieve, and dry the granules at a temperature not exceeding 54° C. (129.2° F.).

Dose, 4 gm. (60 gr.).

Unofficial Preparations.

Caffeinæ Sodio-Benzoas.—Caffeine Sodium Benzoate. Caffeine, 50; Sodium Benzoate, 50; Alcohol, *q.s.*

Dose, .12 to .60 gm.; 2 to 10 gr.

Caffeinæ Sodio-Salicylas.—Caffeine Sodium Salicylate. Caffeine, 50; Sodium Salicylate, 50; Alcohol, *q.s.*

Dose, .12 to .60 gr.; 2 to 10 gr.

ACTION.

It is a stomachic tonic, improving the appetite and digestion. On the heart it causes (1) an acceleration of the rhythm, (2) a shortening of the movements, and in large doses, (3) auriculo-venticular arythmia, terminating in fibrillary contractions of the auricle, and finally of the ventricle. It appears to act directly on the muscle, and the stimulant influence would seem to spread to the auricle before it reaches the ventricle. From stimulation of the vaso-motor centre the vessels are contracted, and a marked rise in blood-pressure results. Small doses increase the excitability of the muscles. By stimulation of the respiratory centre the respiration is quickened and strengthened, but toxic doses finally paralyze this function. Caffeine is a rapidly-acting stimulant to the cerebrum, medulla oblongata, and spinal cord. The sleeplessness often produced by tea and coffee

is probably due in part to stimulation of the nerve centres and partly to the indirect effect of the dilatation of the cerebral blood-vessels caused by the constriction of the vessels of the body generally. Toxic doses, administered to animals, cause convulsions and general paralysis. The urinary secretion is usually increased, though caffeine is by no means a certain diuretic. It is excreted in the urine in small quantities, but a considerable portion is probably decomposed, with the formation of xanthin, which is further broken up into urea.

Uses.

It is employed as a prompt cardiac stimulant, but its chief utility in heart affections is in cases attended with dropsy, where by its diuretic action it often proves highly efficacious. Within certain limitations it is a diuretic of value, though not as reliable as theobromine, and small doses are more efficient as regards the kidneys than large ones. It is contra-indicated in acute renal inflammation. As a stimulant to the central nervous system, and especially to the respiratory centre, it is of great service in cases of poisoning by opium or alcohol. It is also used in hypochondriasis, neurasthenia, nervous headache, neuralgia, typhoid and other fevers, diarrhœal affections, especially when dependent on agencies affecting the nervous system, asthmatic paroxysms, and pneumonia or pulmonary congestion with weak heart. Caffeine sodio-benzoate, hypodermatically, is recommended in puerperal hæmorrhage.

GUARANA.

GUARANA. *Synonym.*—Brazilian Cocoa. A dried paste consisting chiefly of the crushed seeds of *Paullinia Cupana* Kunth (Fam. *Sapindaceæ*), yielding, when assayed, not less than 3.5 per cent. of its peculiar alkaloidal principles. *Habitat.*—Northern and Western Brazil.

Characters.—Usually in cylindrical sticks, about 3 to 5 cm. in diameter, hard and heavy, dark reddish-brown; fracture uneven, often fissured in the centre, pale reddish-brown, showing numerous coarse fragments of seeds and their blackish-brown integuments; odor slight; taste astringent, somewhat smoky, and pleasantly bitter, then sweetish.

Composition.—The chief constituents are—(1) *Guaranine*, identical

with Caffeine (*see* p. 230), 4 to 5 per cent.; (2) Volatile Oil, a trace; (3) *Saponin*; (4) Tannic Acid.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Guaranæ.—Fluidextract of Guarana. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Its effects on the system are mainly those of its alkaloid, and therefore much the same as those of caffeine.

USES.

For headaches chiefly; also in chronic atonic diarrhœa.

Unofficial Preparation.

Theobrominæ Sodio-Salicylas.—Theobromine Sodio-Salicylate. $C_7H_7NaN_4O_2 + NaC_7H_5O_3 = 361.42$. *Synonym.*—Diuretin.

SOURCE.—By the interaction of Sodium Theobromine and Sodium Salicylate. It contains 49.7 per cent. of Theobromine. It corresponds to the Caffeine Sodio-Salicylate, the salt of Caffeine most used in Germany.

CHARACTERS.—A white powder, soluble in half its weight of warm water, the solution remaining perfect when cooled.

Dose, 1 to 2 gm.; 15 to 30 gr.

ACTION.

It is a pure diuretic, acting upon the renal epithelium.

USES.

Especially in cardiac and hepatic dropsy.

Class I of the Volatile Oils also act as Cerebral Excitants.

CLASS II.—DRUGS ACTING CHIEFLY ON THE SPINAL CORD.

A. DRUGS WHICH EXCITE THE CELLS OF THE ANTERIOR CORNUA.

Nux Vomica, Strychnine.

NUX VOMICA.

NUX VOMICA.—*Synonyms.*—Poison Nut. Dog Button. Quaker Button. The dried, ripe seed of *Strychnos Nux-vomica* Linné (Fam. *Loganiaceæ*), yielding, when assayed, not less than 1.25 per cent. of Strychnine. *Habitat.*—India and East Indian Islands.

CHARACTERS.—Orbicular, nearly flat, sometimes irregularly bent, 15 to 30 mm. in diameter, 3 to 5 mm. thick; externally grayish or greenish-gray, the surface covered with short, closely appressed, satiny hairs; rounded or somewhat acute at the margin, with a slight ridge extending from the centre of one side to the edge; internally whitish-gray, horny, very tough, the endosperm in two more or less regular concavo-convex halves, between which, at one end, lie the heart-shaped, palmately nerved cotyledons; inodorous; taste intensely and persistently bitter. Powder light gray, the epidermal cells modified to strongly lignified hairs, endosperm cells thick-walled, containing a fixed oil and aleurone grains, and giving a blue or violet color with Potassium Dichromate and Sulphuric Acid; in the tissues of adhering fruit pulp occur a few small, nearly spherical starch grains.

COMPOSITION.—The chief constituents are—(1) *Strychnine* (*see* below), 0.9 to 1.9 per cent.; (2) *Brucine*, which is dimethyloxylstrychnine, $C_{23}H_{26}N_2O_4$, 0.9 to 1.5 per cent. in colorless prismatic crystals or pearly flakes. Very bitter but less so than Strychnine. *Brucine* is found in Hoang-Nan. *Solubility.*—Freely in Alcohol, and in 7 parts of Chloroform. It has the same action as Strychnine, but is considerably less powerful and slower in its effects. Strong Sulphuric or Nitric Acid gives a blood-red color. (3) *Igasuric Acid*, with which the Strychnine and Brucine are united. (4) *Loganin*, $C_{25}H_{34}O_{14}$, in colorless prisms, an inert glucoside.

Dose, 0.065 gm.=65 milligm. (1 gr.).

Preparations.

1. Extractum Nucis Vomicæ.—Extract of Nux Vomica. By maceration with Acetic Acid, Alcohol and Water, percolation with Alcohol and Water, filtration, evaporation, and the addition of enough Sugar of Milk to bring the quantity of Strychnine in the final dry extract to 5 per cent. of the total weight.

Dose, 0.015 gm.=15 milligm. (¼ gr.).

2. Fluidextractum Nucis Vomicæ.—Fluidextract of Nux Vomica. By digestion with Acetic Acid, Alcohol and Water, and percolation with Alcohol and Water. Distil off the Alcohol, evaporate, and add enough menstruum to make each 100 c.c. of the finished Fluidextract contain 1 gm. of Strychnine.

Dose, 0.05 c.c. (1 ♏).

3. Tinctura Nucis Vomicæ.—Tincture of Nux Vomica. Extract of Nux Vomica, 20; Alcohol and Water to 1000. By solution.

Dose, 0.6 c.c. (10 ♏).

STRYCHNINA. — Strychnine. $C_{21}H_{22}N_2O_2 = 331.73$. An alkaloid obtained from Nux Vomica, and also obtainable from other plants of the *Longaniaceæ*.

SOURCE.—(1) Comminute the Nux Vomica; (2) Extract the Strychnine with water acidulated with Hydrochloric Acid; (3) Concentrate the infusion, decompose the Strychnine with Lime; (4) Extract the Strychnine from the precipitate with boiling Alcohol; (5) Concentrate the solution to obtain the crystals.

CHARACTERS.—Colorless, transparent, prismatic crystals, or a white crystalline powder, odorless, and having an intensely bitter taste perceptible even in highly dilute (1 in 700,000) solution. *Strychnine and its salts should be tasted with extreme caution.* Permanent in the air. *Solubility.*—In 6400 parts of water, 110 of Alcohol, 5500 of Ether, 6 of Chloroform, 150 of Benzene, and 180 of Amyl Alcohol at 25° C. (77° F.); in 3000 parts of water at 80° C. (176° F.), and 28 of Alcohol at 60° C. (140° F.). Sulphuric Acid containing 1 per cent. of Ammonium Vanadate produces with Strychnine a deep violet-blue color, changing to a deep purple, and finally to a cherry-red. Sulphuric Acid containing a trace of Potassium Iodate produces a violet color, changing momentarily to reddish-purple. Nitric Acid, when added to a crystal of Strychnine, on a white porcelain surface, should not produce more than a faintly pink color (limit of Brucine). *Resembling Strychnine.*—Salicylic Acid (*q.v.*).

IMPURITIES.—Brucine, sugar and other readily carbonizable organic impurities.

INCOMPATIBLES.—Alkalies, ammonium chloride, mercuric chloride, gold chloride, tannic, oxalic and picric acids, borax, piperazine, benzoates, cyanides, bichromates, ichthyol, salicylates, iodides and bromides; the last are especially dangerous, for the precipitated strychnine bromide falls slowly.

Dose, 0.001 gm.=1 milligm. ($\frac{1}{60}$ gr.).

Strychnine is used to prepare Elixir Ferri, Quininæ et Strychninæ Phosphatum, Ferri et Strychninæ Citras, Glyceritum Ferri, Quininæ et Strychninæ Phosphatum, Pilulæ Laxativæ Compositæ, and Syrupus Ferri, Quininæ et Strychninæ Phosphatum.

STRYCHNINÆ NITRAS.—Strychnine Nitrate, obtained by the action of Nitric Acid on Strychnine. $C_{21}H_{22}N_2O_2 \cdot HNO_3$, or $NO_2OH \cdot C_{21}H_{22}N_2O_2 = 394.30$.

CHARACTERS.—Colorless, glistening needles; odorless, and having an intensely bitter taste; permanent in the air. *Solubility.*—In 42 parts of water, 120 of Alcohol, 156 of Chloroform, and 60 of Glycerin; soluble in 8 parts of water at 80° C. (176° F.), and in 60 parts of Alcohol at 60° C. (140° F.); insoluble in Ether.

IMPURITY.—Brucine.

Dose, 0.001 gm.=1 milligm. ($\frac{1}{60}$ gr.).

STRYCHNINÆ SULPHAS.—Strychnine Sulphate. $(C_{21}H_{22}N_2O_2)_2 \cdot H_2SO_4 + 5H_2O$; or $SO_2(OH)_2 \cdot (C_{21}H_{22}N_2O_2)_2 + 5H_2O = 850.21$.

SOURCE.—By the action of Diluted Sulphuric Acid on Strychnine, filtration and evaporation.

CHARACTERS.—Colorless or white, prismatic crystals, odorless and having an intensely bitter taste. Efflorescent in dry air. *Solubility.*—In 31 parts of water, 65 of Alcohol, and 325 of Chloroform at 25° C. (77° F); in 6 parts of water at 80° C. (176° F.), and in 20 of Alcohol at 60° C. (140° F.); insoluble in Ether.

Dose, 0.001 gm.=1 milligm. ($\frac{1}{64}$ gr.).

ACTION.

Nux vomica is a stomachic bitter, and promotes intestinal peristalsis by stimulating the muscular coat of the bowel. Strychnine is powerfully antiseptic; it is a vaso-constrictor, causing a rise of blood-pressure; it is a cardiac, and preëminently a respiratory stimulant, but under large doses the stimulation of the medullary centres is followed by depression or paralysis. The most marked effect of toxic amounts is an increased irritability of the spinal cord, which is shown most conspicuously by the production of tetanic spasms. The muscles of respiration, which participate in the general convulsive seizures, ultimately become completely exhausted, and death by asphyxia may occur suddenly after a spasm; in other instances the fatal result is due to gradual paralysis of the respiratory centre. The acuteness of the special senses is increased by small doses. Metabolism is also augmented by strychnine.

USES.

Impaired digestion and general weakness of the system; constipation with feeble contractile power of the muscular coat of the intestine; cardiac diseases, and especially when prompt stimulus is required; pneumonia and poisoning by respiratory depressants; the night-sweats of phthisis; incontinence of urine; amenorrhœa; nervous dysmenorrhœa; impotence; various forms of paralysis, especially those in which there is no well-marked central anatomical lesion. In hemiplegia strychnine may sometimes be of service, but it should not be em-

ployed too early, and is always contra-indicated when headache, vertigo and tinnitus aurium are present.

Toxicology.—The spasms are at first clonic and then tonic, and they rapidly increase in violence. Opisthotonos is a marked feature, and the patient often rests on his head and feet, the remainder of his body being arched above the bed or floor. The chest and abdomen are rigid, the face becomes livid, the eyeballs staring, and the contractions of the facial muscles occasion *risus sardonicus.* Between the paroxysms there is complete muscular relaxation, and this constitutes one of the principal differences between strychnine poisoning and tetanus. *Treatment.*—Give emetics, particularly apomorphine hydrochloride subcutaneously, or wash out the stomach if the patient is seen early enough for the passing of the tube not to cause spasm; potassium permanganate; iodine; chloroform, amyl nitrite, oxygen, by inhalation; external heat; artificial respiration; sodium bromide per rectum. If the case is seen early, give tannin in large quantities; but the insoluble tannate which is formed in the stomach should be gotten rid of as quickly as possible.

B. DRUGS WHICH DEPRESS THE CELLS OF THE ANTERIOR CORNUA.

Physostigma, Gelsemium.

PHYSOSTIGMA.

PHYSOSTIGMA. *Synonyms.*—Calabar bean. Ordeal bean. The ripe seed of *Physostigma venenosum* Balfour (Fam. *Leguminosæ*), yielding, when assayed, not less than 0.15 per cent. of alkaloids soluble in Ether. *Habitat.*—Tropical Western Africa, near the mouth of the Niger and old Calabar.

CHARACTERS.—Oblong, somewhat reniform, 15 to 30 mm. long, 10 to 15 mm. thick; externally reddish- or chocolate-brown, smooth, somewhat roughened near the brownish-black groove which extends almost the entire length of the convex edge, its reddish-rounded margins elevated and somewhat thickened; embryo whitish, with a short, curved hypocotyl and two large, concavo-convex cotyledons; having a bean-like and heavy odor when crushed; taste at first starchy, afterwards acrid.

COMPOSITION.—The chief constituents are:—(1) *Physostigmine* or *Eserine* (*see* below); (2) *Calabarine*, a derivative of *Physostigmine;* (3) *Eseridine;* and (4) Physosterin, a neutral principle, closely related to cholesterine.

Dose, 0.100 gm.= 100 milligm. (1½ gr.).

Preparations.

1. **Extractum Physostigmatis.**—Extract of Physostigma. By maceration, percolation with Alcohol, and evaporation. When

the extract has been evaporated to dryness, 1 gm. is removed and assayed. From the results thus obtained the amount of ether-soluble alkaloids contained in the remainder is ascertained by calculation, and enough powdered Glycyrrhiza (peeled, Russian) is added to bring the quantity of the alkaloids in the finished powdered extract to 2 per cent.

Dose, 0.008 gm.=8 milligm. (⅛ gr.).

2. Tinctura Physostigmatis.—Tincture of Physostigma. Physostigma, 100. By maceration and percolation with Alcohol to 1000.

Dose, 1 c.c. (15 ♏).

PHYSOSTIGMINÆ SALICYLAS.—Physostigmine Salicylate, $C_{15}H_{21}N_3O_2 \cdot C_7H_6O_3 = 410.21$. *Synonym.*—Eserine Salicylate. The Salicylate $[C_6H_4(OH)COOH \cdot C_{15}H_{21}N_3O_2]$ of an alkaloid obtained from Physostigma. It should be kept in dark, amber-colored, well-stoppered vials.

SOURCE.—By adding Physostigmine to a solution of Salicylic Acid in boiling Distilled Water, and allowing the salt to crystallize on cooling.

CHARACTERS.—Colorless or faintly yellowish, shining, acicular, or short, columnar crystals, odorless, and having a slightly bitter taste. *It should be tasted with great caution.* It acquires a reddish tint when long exposed to light and air. *Solubility.*—In 72.5 parts of water, 12.7 of Alcohol, 175 of Ether, and 8.6 parts of Chloroform; in 15 parts of water at 80° C. (176° F.), and 4 parts of Alcohol at 60° C. (140° F.).

IMPURITY.—Physostigmine sulphate.

Dose, 0.001 gm.=1 milligm. ($\frac{1}{60}$ gr.).

PHYSOSTIGMINÆ SULPHAS.—Physostigmine Sulphate. $(C_{15}H_{21}N_3O_2)_2 \cdot H_2SO_4 = 643.75$. *Synonym.*—Eserine Sulphate. The Sulphate $[SO_2(OH)_2 \cdot (C_{15}H_{21}N_3O_2)_2]$ of an alkaloid obtained from Physostigma. It should be kept in well-stoppered, dark amber-colored vials.

CHARACTERS.—A white, or yellowish-white, micro-crystalline powder, odorless, and having a bitter taste. *It should be tasted with great caution.* It is very deliquescent, and gradually turns reddish by exposure to air and light. *Solubility.*—Very soluble in water, Alcohol and Chloroform.

IMPURITY.—Physostigmine salicylate.

Dose, 0.001 gm.=1 milligm. ($\frac{1}{60}$ gr.).

ACTION.

Increases the secretions by stimulating the terminations of the secretory nerves in the gland-cells; increases gastric and intestinal peristalsis, like pilocarpine, the peristaltic movements culminating in a tetanic contraction of the muscular walls; also induces con-

traction of unstriped muscle in various parts of the body, as the uterus, iris, bronchial tubes, etc.; causes a considerable rise in blood-pressure from the violent contractions of the stomach and intestine, which is followed by a fall, due to paralysis of the vaso-motor centre; slows the pulse by direct action on the cardiac muscle; weakens and eventually paralyzes the respiration, death taking place from asphyxia. The central nervous system is depressed, and reflex activity is inhibited in consequence of the effect produced upon the anterior cornua of the spinal cord. Muscular twitchings constitute a characteristic feature of the poisoning, and some contraction of the pupil is generally observed. Physostigmine, applied to the conjunctiva, always causes the pupil to contract to its smallest diameter.

Uses.

Atony of the bladder and intestines; gastric and intestinal dilatation; flatulence; chronic respiratory affections; tetanus; trismus neonatorum and other spasms; epilepsy; chorea; as an antidote in strychnine poisoning. Physostigmine is used locally in ophthalmic practice.

GELSEMIUM.

GELSEMIUM. *Synonym.*—Yellow Jasmine. The dried rhizome and roots of *Gelsemium sempervirens* (Linné) Aiton filius (Fam. *Loganiaceæ*). *Habitat.*—Southern United States.

Characters.—Cylindrical, usually in cut pieces of variable length, from 5 to 20, or even 30, mm. in diameter; externally light yellowish-brown, with purplish-brown longitudinal lines; fracture of the rhizome splintery, the roots breaking with one-half the fracture transverse, the other half oblique or short-splintery; bark about 1 mm. thick; wood pale yellow, porous, but tough, with numerous distinct medullary rays, in the rhizome eccentric, and with four groups of internal phloem; odor pronounced, characteristic; taste slightly aromatic, bitter.

Composition.—The chief constituents are—(1) *Gelsemine*, $C_{54}H_{60}N_4O_{12}$, a colorless, with difficulty crystallizable, bitter alkaloid, soluble in Alcohol and Ether, sparingly in water. (2) *Gelseminine*, a brown, amorphous, bitter alkaloid, very poisonous. (3) *Gelseminic Acid*. (4) A volatile oil.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Preparations.

1. **Fluidextractum Gelsemii.**—Fluidextract of Gelsemium. By maceration and percolation with Alcohol, and evaporation.

Dose, 0.05 c.c. (1 ♏).

2. **Tinctura Gelsemii.**—Tincture of Gelsemium. Gelsemium, 100; by maceration and percolation with Alcohol and water, to 1000.

Dose, 0.5 c.c. (8 ♏).

Action.

It is depressant to the central nervous system; toxic doses paralyze the respiratory centre in the medulla and cause death by asphyxia. Loss of coördinating power and extreme muscular weakness, with tremors, are characteristic features of the poisoning. Applied directly to the eye in solution, it causes rapid dilatation of the pupil and paralysis of accommodation. In general poisoning by the drug marked mydriasis does not occur until quite late; disturbance of vision, followed by diplopia and ptosis, frequently occurs, and these effects have been attributed to paralysis of the ocular muscles.

Uses.

Neuralgia, especially of the facial branches of the trigeminus; migraine; eczema and pruritus; Ménière's disease; bilious colic; torticollis; rigid os in labor; after-pains; spasmodic dysmenorrhœa; hæmoptysis; laryngismus stridulus; asthma; whooping-cough; as an antispasmodic in coughs in general; locally, to dilate the pupil and paralyze accommodation.

CLASS III.—DRUGS ACTING CHIEFLY ON THE NERVES.

A. DRUGS WHICH DEPRESS THE MOTOR NERVES.

Conium.

CONIUM.

CONIUM. *Synonym.*—Spotted Hemlock. The full grown but unripe fruit of *Conium maculatum* Linné (Fam. *Umbelliferæ*), carefully dried and preserved, and yielding, when assayed, not less than 0.5 per cent. of Conine. After being kept for more than two years Conium is unfit for use. *Habitat.*—Europe and Asia; naturalized in North America.

CHARACTERS.—Broadly ovoid, greenish-gray, the two carpels of most of the fruits separated, each about 3 mm. long and about 1.5 mm. in diameter, ovoid, somewhat curved, the inner, flattened side marked by a deep longitudinal groove, the outer, convex side with five pale yellow, somewhat crenate ribs, the intervening surfaces wrinkled, but otherwise smooth; pericarp without oil tubes; odor slight, but when triturated with a solution of Potassium Hydroxide, strong, disagreeable and mouse-like; taste characteristic, disagreeable, afterwards somewhat acrid. *Resembling conium fruit.*—Caraway, anise, dill, all known by having vittæ (oil tubes).

COMPOSITION.—The chief constituents are—(1) *Coniine*, $C_8H_{17}N$, the active principle; a colorless, oily, volatile alkaloid, of a disagreeable odor and acrid taste. *Solubility.*—In 100 parts of water. It is easily obtained from the plant by distillation with alkalies. It is readily decomposed by light and heat, and the preparations of Conium are therefore of very varying strengths. Its salts are much more stable. (2) *Methyl-coniine*, $C_8H_{19}CN$. A colorless, liquid alkaloid. (3) *Conhydrine*, a nearly inert crystallizable alkaloid.

INCOMPATIBLES.—Caustic alkalies, vegetable acids, astringents.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

Preparation.

Fluidextractum Conii.—Fluidextract of Conium. By maceration and percolation with Diluted Alcohol and Acetic Acid, and evaporation.

Dose, 0.2 c.c. (3 ♏).

ACTION.

It has no marked gastro-intestinal or cardiac effects; the respiration is at first stimulated and then depressed; under poisonous doses there is a characteristic ascending motor paralysis, beginning with the lower extremities and finally reaching the tongue, and the sensory nerves are also depressed; the consciousness and intelligence remain unimpaired; there are dilatation of the pupils, ptosis, and often imperfect vision from paralysis of accommodation. The drug is rapidly excreted by the kidneys.

USES.

Conium has fallen into almost complete disuse, owing in part to the unreliability of its preparations. It has been employed in spasmodic affections, as chorea, paralysis agitans, tetanus, whooping-cough, asthmatic attacks, and laryngismus stridulus,

but appears to have little value except in spasms due to irritation of a nerve-trunk.

Toxicology.—Empty the stomach; strychnine and other stimulants subcutaneously; warmth to the surface; artificial respiration.

B. DRUGS WHICH DEPRESS THE MOTOR END-PLATES.

Curare.

Unofficial Preparation.

Curara. — Curare. *Synonyms.* — Wourara. Ourari. Urari. Wourali. The South American arrow poison, prepared from spices of *Strychnos* (Fam. *Loganiaceæ*) and other plants.

CHARACTERS.—A blackish-brown, dry extract, brittle or hydroscopic, with a bitter taste. *Solubility.*—Almost completely in Diluted Alcohol.

COMPOSITION.—It contains an extremely active poison, *Curarina* or *Curarine*, $C_{18}H_{35}N$, a yellowish-brown powder intensely bitter.

Dose, .0025 to .03 gm.; $\frac{1}{25}$ to $\frac{1}{2}$ gr.

The following is proposed for hypodermatic injection of Curara: Curare, 1; add distilled water to form a thin paste. Put in a funnel plugged with absorbent wool, and gradually add more water until 12 parts are obtained. Of this the dose is .06 to .25 c.c.; 1 to 6 m.

Lamellæ or discs, each containing .003 gm.; $\frac{1}{20}$ gr., are also prepared. They are dissolved in a few drops of water before injection subcutaneously.

ACTION.

Its characteristic effects are paralysis of nerve endings in striped muscles and, later, of the nerve endings around sympathetic ganglia. Under large doses a direct depression of the irritability of the muscle substance is induced, and when curare is applied directly to the spinal cord it causes typical strychnine convulsions.

USES.

Tetanus; epilepsy.

C. DRUGS WHICH DEPRESS THE SENSORY NERVES.

Coca, Cocaine, Menthol.

COCA.

COCA. *Synonyms.*—Erythroxylon. Cuca. The dried leaves of *Erythroxylon Coca* Lamarck (Fam. *Erythroxylaceæ*), known commercially

as Huanuco Coca, or of *E. Truxillense* Rusby, known commercially as Truxillo Coca, yielding, when assayed, not less than 0.5 per cent. of the ether-soluble Alkaloids of Coca. *Habitat.*—Peru and Bolivia; cultivated.

CHARACTERS.—*Huanuco Coca.*—Greenish-brown to clear brown, smooth and slightly glossy, thickish and slightly coriaceous, stoutly and very shortly petioled; blade 2.5 to 7.5 cm. long and nearly elliptical, with a very short and abruptly narrowed basal portion and a short point, the margin entire; midrib marked above by a slight ridge, very prominent underneath, the remaining venation rather obscure, especially above; underneath, a conspicuous line of collenchyma tissue runs longitudinally on either side of the midrib and about one-third of the distance between it and the margin, the enclosed areola being of a slightly different color from the adjacent surface; odor characteristic; taste bitterish, faintly aromatic, followed by a numbness of the tongue, lips, and fauces.

Truxillo Coca.—Pale green, thin, brittle and usually much broken, smooth but not shining, shortly and stoutly petioled; blade 1.6 to 5 cm. long and one-third to one-half as broad, obovate to oblanceolate, narrowed from near the middle into the petiole, usually with a slight projecting point at the summit, the margin entire; underneath two irregular lines of collenchyma tissue, usually incomplete or obscure, and frequently wanting, run beside the midrib at about one-third the distance from it to the margin; odor more tea-like than that of Huanuco Coca; taste and numbing effect similar.

COMPOSITION.—It contains at least three alkaloids, viz.—(1) *Cocaine*, which is methyl benzoyl ecgonine, 0.2 per cent.; (2) *Cocamine* or isatrophylcocaine; (3) *Cinnamylcocaine.* Also (4) Coca-tannic acid and (5) Coca-wax. Different specimens vary very much in strength of Cocaine. Fresh specimens are stronger than those that have been kept.

Dose, 2 gm. (30 gr.).

Preparations.

1. Fluidextractum Cocæ.—Fluidextract of Coca. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

2. Vinum Cocæ.—Wine of Coca. Fluidextract of Coca, 65; Alcohol, 75; Sugar, 65; Red Wine to 1000. By solution and filtration.

Dose, 16 c.c. (4 fl. dr.).

COCAINA. Cocaine. $C_{17}H_{21}NO_4 = 300.92$. An alkaloid derived from several varieties of Coca.

SOURCE.—Coarsely ground Coca leaves are re-percolated with an aqueous 5 per cent. solution of Sulphuric Acid, by which a very dense, slightly acid percolate is obtained; this is thoroughly agitated with pure Coal Oil and an excess of Sodium Carbonate; the liberated alkaloid is retained by the Coal

Oil, and is nearly free from coloring matter; the oily solution is then agitated with acidulated water, and again precipitated by Sodium Carbonate in the presence of Ether.

CHARACTERS.—Large, colorless, four-sided or six-sided, monoclinic prisms, having a slightly bitter taste and producing on the tongue a temporary numbness. *Solubility.*—In 600 parts of water and in 260 of water at 80° C. (176° F.); in 5 parts of Alcohol and 3.8 of Ether; in about 14 parts of Oil of Turpentine and in about 12 parts of Olive Oil; very soluble in Chloroform and warm Alcohol; soluble in Benzene, Carbon Disulphide, and Ethyl Acetate; insoluble in Glycerin.

IMPURITIES.—Cinnamyl-cocaine and isatropyl-cocaine.

INCOMPATIBLES.—Mineral acids (decompose cocaine into benzoic acid and ecgonine), alkalies, bromides of the alkalies, chloroform water, menthol, mercury salts, silver nitrate.

Dose, 0.030 gm.=30 milligm. (½ gr.).

Preparation.

Oleatum Cocainæ.—Oleate of Cocaine. Cocaine, 5; Alcohol, 5; Oleic Acid, 50; Olive Oil to 100.

COCAINÆ HYDROCHLORIDUM.—Cocaine Hydrochloride. $C_{17}H_{21}NO_4 \cdot HCl = 337.10$. The neutral hydrochloride $[HCl \cdot C_8H_{13}(C_6H_5CO)NO \cdot COOCH_3]$ of an alkaloid obtained from several varieties of Coca.

SOURCE.—Agitate with Ether an aqueous solution of an acidulated Alcoholic extract, make alkaline with Sodium Carbonate; separate and evaporate the Ethereal liquid; purify by repetition; decolorize, neutralize with Hydrochloric Acid, and re-crystallize.

CHARACTERS.—Colorless, transparent, monoclinic prisms, flaky, lustrous leaflets, or a white, crystalline powder; permanent in the air, containing no water of crystallization; odorless; of a saline, slightly bitter taste, and producing upon the tongue a tingling sensation followed by numbness of several minutes' duration. *Solubility.*—In 0.4 part of water, 2.6 parts of Alcohol, and 18.5 parts of Chloroform; insoluble in Ether, Benzene and Petroleum Benzin.

IMPURITIES.—The same as of Cocaine.

INCOMPATIBLES.—Calomel, chloroform water, mercuric oxide. *Physiological Incompatibles.*—Alcohol, amyl nitrite, caffeine, digitalis, hydrated chloral, morphine.

Dose, 0.030 gm.=30 milligm. (½ gr.).

ACTION.

Cocaine is a protoplasmic poison and induces complete local anæsthesia. Coca leaves, when chewed,, relieve hunger and

fatigue and allay irritability of the stomach. The drug tends to stimulate the vagus centre, increase the pulse-rate, constrict the arterioles, and cause a marked rise in blood-pressure, though later the blood-pressure falls; the respiratory functions are at first stimulated and afterwards depressed, and under poisonous doses death occurs from asphyxia. The higher parts of the brain are at first stimulated and the muscular power greatly increased, while the various medullary centres are first stimulated and then depressed. There is primary stimulation of the spinal cord also, with exaggeration of the reflexes, and very large doses may cause strychnine-like convulsions. In the eye mydriasis is produced and accommodation impaired. Cocaine is eliminated chiefly in the urine.

Uses.

Cocaine is more largely employed to produce local anæsthesia than any other agent; injected into the arachnoid space of the spinal cord it has also been used to cause general anæsthesia for surgical operations. The preparations of coca are prescribed as stomachic tonics and in the debility of convalescence from acute diseases, and cocaine has been given internally in chorea, paralysis agitans, alcoholic tremors, and senile trembling.

Toxicology. Acute poisoning.—If the drug has been taken by the mouth, wash out the stomach or give some prompt emetic, like apomorphine. The treatment is mainly one of stimulation. Strychnine is especially indicated, and artificial respiration may be called for; amyl nitrite if the blood-pressure is high; inhalation of chloroform or ether may be required for the convulsive attacks. *Chronic poisoning.*—The central nervous system seems to undergo degeneration like that met with in chronic morphine poisoning, and the cocaine *habitué* sinks to the greatest moral degradation. There is little chance of a cure unless the patient is confined for a considerable time in an institution.

Unofficial Preparation.

Holocaina.—Holocaine. $(OC_2H_5 \cdot C_6H_4 \cdot NH \cdot C(CH_3)N \cdot C_6H_4 \cdot OC_2H_5)HCl$. *Synonyms.*—Holocaine Hydrochloride. Paradiethoxyethenyl-diphenyl-amidine Hydrochloride.

Source.—Obtained by combining in molecular quantities Acetphenetidin and Paraphenetidin, with the elimination of water,

leaving the base—$OC_2H_5 \cdot C_6H_4NHC \cdot O \cdot CH_3 + H_2N \cdot C_6H_4 \cdot O \cdot C_2H_5 = OC_2H_5 \cdot C_6H_4NHC \cdot CH_3 \cdot N \cdot C_6H_4 \cdot O \cdot C_2H_5 + H_2O$. The hydrochloride is formed by the action of Hydrochloric Acid upon this base, and this salt is the one employed in Medicine.

CHARACTERS.—In colorless crystals, having a bitter taste. It is very sensitive to alkalies, even the small amount of alkali dissolved out of the glass on boiling a solution of the salt in a test-tube being sufficient to decompose it. *Solubility.*—In about 50 parts of water, and 6 of Alcohol.

ACTION.

Locally anæsthetic; powerfully antiseptic; it is considerably more toxic than cocaine, but does not produce any local necrosis and has no effect upon the blood-vessels.

USES.

As a local anæsthetic for the same purposes as cocaine; it is largely employed in ophthalmic practice, where its peculiar value lies in the rapidity of its action and the fact that it leaves the pupil, accommodation and intra-ocular tension unaffected; its germicidal power is a further advantage. A 1 per cent. solution is generally used, and it should be prepared in porcelain (not in glass).

MENTHOL.

MENTHOL. $C_{10}H_{19}OH = 154.98$.—A secondary Alcohol [$C_6H_9(CH_3)$-$(OH)(C_3H_7)$ 1 : 3 : 4], obtained from the oil from *Mentha piperita* Linné, or from other peppermint oils.

SOURCE.—By fractional distillation of the volatile oil and freezing the higher boiling product, and crystallization.

CHARACTERS.—Colorless, acicular or prismatic crystals, having a strong and pure odor of peppermint, and a warm, aromatic taste, followed by a sensation of cold, when air is drawn into the mouth. *Solubility.*—Only slightly soluble in water, but imparts to the latter its odor and taste; freely soluble in Alcohol, Ether and Chloroform. When it is triturated with about an equal weight of Camphor, Thymol, or Hydrated Chloral, the mixture becomes liquid.

IMPURITIES.—Thymol, wax, paraffin, inorganic substances.

Dose, 0.065 gm. =65 milligm. (1 gr.).

Action.

Antiseptic; locally anæsthetic. It produces a sensation of coldness wherever it is applied, and this is associated with more or less prickling and followed later by some heat and burning.

Uses.

Superficial neuralgic pains and superficial inflammations; laryngeal and tracheal tuberculosis; bronchiectasis; diseases of the ear and nose; and hay-fever (by inhalation). Internally, for nausea and vomiting, spasmodic cough, asthma and hiccough.

D. DRUGS WHICH STIMULATE THE SECRETORY NERVES.

Pilocarpus.

PILOCARPUS.

PILOCARPUS. *Synonym.*—Jaborandi. The leaflets of *Pilocarpus Jaborandi* Holmes or of *Pilocarpus microphyllus* Stapf (Fam. *Rutaceæ*), yielding, when assayed, not less than 0.5 per cent. of alkaloids. *Habitat.*—Brazil, near Pernambuco.

Characters. *Pilocarpus Jaborandi.*—Very shortly and stoutly petioluled, the blades 6 to 12 cm. long and 2 to 4 cm. broad, oblong or oval, mostly unequaled at the base, blunt and emarginate at the summit, the margin entire and narrowly revolute; yellow-green, very smooth, shining, thick and coriaceous, the reticulate venation prominent on both sides, especially beneath; strongly pellucid-glandular; peculiarly aromatic when crushed; taste bitterish, slightly salty, aromatic, later somewhat pungent and sialagogue.

Pilocarpus microphyllus.—Leaflets 1.2 to 3.7 cm. long; 0.8 to 1.6 cm. broad; the lateral without petiolules, rhomboidally oval to obovate, acute at the base, blunt and unequally emarginate at the summit; the terminal on short, margined petiolules, almost equally oval to obovate, rather narrower than the lateral; all thickish and rigid, with entire margin, smooth and dull green, finely pellucid-glandular; midrib stout, the veins rather coarsely reticulate, lightly prominent; almost odorless; taste similar to that of *Pilocarpus Jaborandi.*

Impurities.—Leaves of species of Piper, not oval-oblong.

Composition.—The chief constituents are—(1) A crystalline alkaloid, *Pilocarpine*, $C_{11}H_{16}N_2O_2$, ¼ to 1 per cent. (2) *Isopilocarpine*, a basic entrance isomeric with Pilocarpine, obtained, in varying amount, as a colorless viscid oil, boiling at 261° C. (501.8° F.) under 10 mm. pressure, which can be distilled without decomposition. (3) A volatile oil, chiefly a terpene (*Pilocarpene*, $C_{10}H_{16}$), about 0.5 per cent. In addition, there are present

a little malic acid, resin, tannin, etc. *Jaborine*, $C_{22}H_{32}N_4O_4$, an alkaloid resembling in its physiological action Atropine, and therefore antagonistic to Pilocarpine, formerly supposed to be one of the constituents of the drug; does not exist in the Jaborandi beans at present obtainable. (3) *Pilocarpidine*, $C_{10}H_{14}N_2O_2$, a decomposition product whose action is weaker than Pilocarpine, is found in *P. Jaborandi*, but not in *P. microphyllus*.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Pilocarpi.—Fluidextract of Pilocarpus. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

PILOCARPINÆ HYDROCHLORIDUM.—Pilocarpine Hydrochloride. $C_{11}H_{16}N_2O_2HCl = 242.81$. The hydrochloride ($HCl \cdot C_{11}H_{16}N_2O_2$) of an alkaloid obtained from Pilocarpus. It should be kept in well-stoppered, amber-colored vials.

SOURCE.—Obtained by neutralizing diluted Hydrochloric Acid with pure Pilocarpine, concentrating the solution, and then setting it aside over Sulphuric Acid to crystallize.

CHARACTERS.—Colorless, or white, transparent crystals, odorless, and having a faintly bitter taste; deliquescent on exposure to air. It contains no water of crystallization. *Solubility.*—Soluble in 0.3 part of water, 2.3 of Alcohol, and 540 of Chloroform; insoluble in Ether.

INCOMPATIBLES.—Silver nitrate, mercuric chloride, calomel, gold salts, potassium permanganate, tannin, iodides, alkalies.

IMPURITY.—Other alkaloids.

Dose, 0.010 gm. = 10 milligm. (⅙ gr.).

PILOCARPINÆ NITRAS.—Pilocarpine Nitras. $C_{11}N_{16}N_2O_2 \cdot HNO_3 = 269.20$. The nitrate ($NO_2OH \cdot C_{11}H_{16}N_2O_2$) of an alkaloid obtained from Pilocarpus. It should be kept in well-stoppered, amber-colored vials.

SOURCE.—By neutralizing Nitric Acid with Pilocarpine.

CHARACTERS.—Colorless, or white, shining crystals, odorless, and having a faintly bitter taste; permanent in the air, containing no water of crystallization. *Solubility.*—In 4 parts of water and 60 of Alcohol; in 16 parts of Alcohol at 60° C. (140° F.); insoluble in Ether and Chloroform.

IMPURITIES.—Pilocarpine hydrochloride and other alkaloids.

Dose, 0.010 gm. = 10 milligm. (⅙ gr.).

ACTION.

Especially stimulates the terminations of the secretory nerves, the first effect being a marked increase of the saliva; also stimu-

lates unstriped muscle generally (with the exception of that of the blood-vessels), and particularly in the intestine, causing violent peristalsis. The heart is at first accelerated and then slowed, and the blood-pressure first rises and then falls. The pupil is contracted, and spasm of accommodation occurs. The effects on the central nervous system are mainly depressing; they appear late and are quite overshadowed by the peripheral effects. This drug is the most efficient sudorific known, and with the exception of the diaphoresis its most important effects are the salivation and the myosis. In consequence of the hyperæmia of the skin caused by it, the temperature may be temporarily elevated, but the evaporation of the sweat soon produces a decided fall.

Uses.

It is given whenever a prompt diaphoretic effect is desired, and especially in cases of Bright's disease; in dropsy due to cardiac disease it is usually too depressing. It is also employed in catarrhal jaundice and in affections of the eye and ear. Externally it is used for promoting the growth of the hair. Atropine is a physiological antidote, and should be given in cases of poisoning by the drug.

GROUP II.—Drugs whose Main Action is on the Heart.

CLASS I.—THE DIGITALIS GROUP, DECREASING THE FREQUENCY AND INCREASING THE FORCE OF THE BEAT OF THE HEART.

Digitalis, Strophanthus, Convallaria, Squill, Scoparius, Camphor, Erythrophlœum, Adonidin.

DIGITALIS.

DIGITALIS. *Synonym.*—Foxglove. The dried leaves of *Digitalis purpurea* Linné (Fam. *Scrophulariaceæ*), collected from plants of the second year's growth, at the commencement of flowering. *Habitat.*—Europe, in sandy soil and the edges of woods.

Characters.—Usually in more or less crumpled and broken fragments; ovate to oval, from 10 to 30 cm. long, 5 to 15 cm. broad, abruptly contracted into a winged petiole from 5 to 10 cm. long; thin, dull and rather pale-green or grayish underneath; upper surface wrinkled, sparsely hairy; lower surface densely and finely hairy, the venation conspicuously reticulated; margin

crenate or erose-dentate; the midrib and principal veins broad and flat, usually purplish, the lower veins continued into the wings of the petiole; odor slight, characteristic; taste strongly bitter.

In the powder, stone-cells, star-shaped hairs, and Calcium Oxalate crystals are absent. *Resembling Digitalis leaves.*—Matico leaves, which are more deeply reticulated.

Composition.—The chief constituents are—(1) *Digitoxin*, a glucoside, crystallizable, the most active principle, very poisonous, cumulative. Insoluble in water, sparingly in Ether, easily in Chloroform and Alcohol. Exists as minute white crystals. Dose, .00025 to .00125 gm.; $\frac{1}{250}$ to $\frac{1}{50}$ gr. (2) *Digitalin*, a crystalline glucoside, possessing in a high degree the actions of Digitalis. It is also called Digitalinum Verum. Soluble in water, 1 in 1000. Dose, .0003 to .0006 gm.; $\frac{1}{200}$ to $\frac{1}{100}$ gr. sub-cutaneously. (3) *Digitalein*, an amorphous glucoside not yet proved to be a definite chemical substance, soluble in water, and therefore suitable for hypodermatic injections; dose hypodermatically .0006 gm.; $\frac{1}{100}$ gr., said to be non-cumulative. These three glucosides are said to represent the cardiac stimulating action of the drug. (4) *Digitonin*, $C_{27}H_{44}O_{13}$, a glucoside closely allied both chemically and physiologically to, and perhaps identical with, the Saponin of Senega (*q.v.*). Dose, .0002 to .0006 gm.; $\frac{1}{300}$ to $\frac{1}{100}$ gr. This is a cardiac depressant, and is therefore antagonistic to the other active principles. (5) *Digitin*, a glucoside devoid of physiological action. All these five glucosides are non-nitrogenous. (6) Two acids, Digitalic and Antirrhinic. (7) Other usual constituents of plants, as tannic acid, volatile oil, coloring matter, starch, sugar, gum, salts. It will be noticed that Digitalis contains no Alkaloids.

The following substances, all soluble in alcohol, are met with in commerce: (**A**) Homolle's *Digitalin* (same as Quevenne's), an amorphous yellowish-white powder or small scales, intensely bitter, inodorous, but irritating to the nostrils. Soluble in 2000 parts of water. Consists chiefly of *Digitalin* with a little *Digitoxin*. Possesses the action of the leaves. Granules of it are much used in France; each usually contains .001 gm.; $\frac{1}{65}$ gr., which is equal to .10 gm.; 1½ gr., of the powdered leaves. (**B**) Nativelle's *Digitalin*, $C_{25}H_{40}O_{15}$, light, white, crystalline tufts of needles, very bitter. Soluble in Chloroform and in Alcohol, not in Water or Ether. It consists very largely of *Digitoxin* and is cumulative. Dose, .001 to .002 gm.; $\frac{1}{60}$ to $\frac{1}{30}$ gr., in a pill. (**C**) German Digitalinum Purum. Dose, .001 to .002 gm.; $\frac{1}{60}$ to $\frac{1}{30}$ gr., soluble in water. Consisting of *Digitalein*, with some *digitalin* and *digitonin*. (**D**) Digitoxin, already described. (**E**) Digitalin, already described. None of the above constituents is official.

Incompatibles.—Acids, alkalies, alkaloidal precipitants (among which are included picric and tannic acids, auric chloride, iodine in a solution of potassium iodide, and potassio-mercuric iodide), ferrous sulphate, lead

acetate, vegetable astringents. *Physiological Incompatibles.*—Aconite, cocaine, hydrated chloral, murcarine, nitroglycerin, saponin, scoparin, strychnine.

Dose, 0.065 gm. =65 milligm. (1 gr.).

Preparations.

1. **Extractum Digitalis.**—Extract of Digitalis. By evaporation of the Fluidextract to a pilular consistence.

Dose, 0.010 gm. =10 milligm. ($\frac{1}{6}$ gr.).

2. **Fluidextractum Digitalis.**—Fluidextract of Digitalis. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 0.05 c.c. (1 ♏).

3. **Infusum Digitalis.**—Infusion of Digitalis. Digitalis, 15; Cinnamon Water, 150; boiling water, 500; Alcohol, 100; cold water to 1000.

Dose, 8 c.c. (2 fl. dr.).

4. **Tinctura Digitalis.**—Tincture of Digitalis. Digitalis, 100; Diluted Alcohol to 1000. By maceration and percolation.

Dose, 1 c.c. (15 ♏).

As the proportion of the many constituents varies in the preparations, some prefer always to give the powdered leaves.

Unofficial Preparations.

1. **Digitalinum.**—Digitalin. (*See above.*)
2. **Digitoxinum.**—Digitoxin. (*See above.*)

ACTION.

It is a gastro-intestinal irritant. It slows the beat of the heart; the diastole is prolonged, the force of the systole increased, and the size of the individual pulse-wave is also increased. Under digitalis the work done by the heart is much greater than normal, and the slowness developed is not sufficient to counter-balance the increased output at each ventricular contraction. Later, if enough of the drug has been taken, the heart's action becomes extremely fast and irregular, the strength of the ventricular contractions diminishes, and the output of the heart rapidly declines. Digitalis is preëminently a vaso-constrictor, and it causes a marked rise in blood-pressure; under toxic doses the pressure diminishes with the extreme slowing of the heart, but, as the organ becomes accelerated, it again rises to a pronounced degree. Finally, as the

heart becomes irregular, the blood-pressure declines until it reaches zero, when the heart stops. In health the diuretic effect is not marked, and seems to be due to the cardiac action of the drug. Under therapeutic doses the only action upon the central nervous system appears to be the stimulation of the inhibitory cardiac and the vaso-motor centres in the medulla, but poisonous doses affect other centres, and general convulsions may eventually result. Finally, the motor nerve-trunks are depressed and the muscles are paralyzed. While the cerebrum is not directly affected, the disturbances caused in its circulation are liable to give rise to severe headache, excessive vomiting, dizziness, vertigo, confusion of sight, and possibly hallucinations and delirium. A peculiar blue color of the sclerotic has been quite constantly noted in acute poisoning.

Uses.

The most important use of digitalis is in diseases of the heart; it is indicated, in general, when the cardiac action is rapid and feeble, with low arterial tension, and contra-indicated when the cardiac action is strong and the arterial tension high. It not only slows and steadies the heart, but also improves the nutrition of its walls. It should be administered with caution, and should always be stopped as soon as symptoms of gastro-intestinal irritation occur, or the pulse becomes abnormally slow. It has a cumulative effect, and should not be given too long continuously. It is especially valuable in cases of mitral disease in which compensation has begun to fail and in which there is dropsy; when cardiac dropsy is present digitalis is usually an efficient diuretic. In diseases of the aortic valve it is of much less benefit, and is often entirely contra-indicated. Still, the indication for giving or withholding digitalis is, not so much the particular valvular lesion present, as the effects which have been produced by this upon the cardiac wall. The constriction of the peripheral vessels caused by the drug may, when necessary, be counteracted to a considerable extent by the simultaneous administration of remedies causing vaso-dilatation, such as the nitrites. Digitalis is

much used also in cardiac affections which are not due to valvular disease, and is highly esteemed in the weakness of the heart resulting from various acute diseases and from such causes as hæmorrhage, poisoning, injury and shock. Other conditions in which it is employed are, acute desquamative nephritis, chronic nephritis when there is dilatation of the left ventricle with mitral regurgitation, exophthalmic goitre, chronic bronchitis, pneumonia, scarlet fever, chronic alcoholism, nocturnal seminal emissions, and certain hæmorrhages, including those from the uterus. The tincture of digitalis sometimes occasions much gastric disturbance, and under the supposition that this may be due in part, if not wholly, to the fixed oil of the leaf and its free acids, a so-called fat-free tincture has been prepared in which these two principles are eliminated.

STROPHANTHUS.

STROPHANTHUS.—The ripe seed of *Strophanthus Kombé* Oliver (Fam. *Apocynaceæ*), deprived of its long awn. *Habitat.*—Tropical Africa.

CHARACTERS.—Of a light fawn-brown color, with a distinct greenish tinge; about 15 mm. long and 4 to 5 mm. wide, 2 to 2.5 mm. thick, lance-ovoid, obtuse at the base, gradually acuminate and somewhat acute at the summit, usually twisted, bearing on one side a ridge running from about the centre to the apex; silky-lustrous from a dense coating of closely appressed hairs, which mostly lie in longitudinal grooves on the surface; fracture short and somewhat soft, the fractured surface whitish and oily; kernel consisting of a thin endosperm enclosing straight cotyledons; odor slight, or heavy when the seeds are crushed and moistened; taste very bitter.

COMPOSITION.—The chief constituents are—(1) *Strophanthin*, $C_{31}H_{48}O_{12}$. It exists in all parts of the plant but mostly in the seeds (8 to 10 per cent.). This is in all probability the same as, or closely allied to, the active principle Ouabain, which has been isolated from some other species of Strophanthus. It is a transparent, white, imperfectly crystalline, bitter glucoside (being split up by acids into glucose and *Strophanthidin*). Very soluble in water; insoluble in Chloroform and Ether. *Strophanthin*, according to recent investigation, can be isolated from *Strophanthus Kombé*, and many other species of *Strophanthus*. (2) *Kombic Acid*, which is not identical in all varieties of *Strophanthus*. (3) *Ineine*, an Alkaloid. (4) Tanghinin, $C_{27}H_{40}O_8$, in rhombic prisms.

Dose, 0.065 gm. =65 milligm. (1 gr.).

Preparation.

Tinctura Strophanthi.—Tincture of Strophanthus. Strophanthus, 100. By digestion and percolation with Alcohol and Water to 1000.

Dose, 0.5 c.c. (8 ♏).

STROPHANTHINUM.—Strophanthin. A glucoside, or mixture of glucosides, obtained from Strophanthus. It should be kept in well-stoppered, amber-colored vials.

CHARACTERS.—A white or faintly yellowish crystalline powder, containing varying amounts of water of crystallization, which it does not lose entirely without decomposition; taste intensely bitter. *Great caution should be used in tasting it.* Permanent in the air. *Solubility.*—Very soluble in water and in Diluted Alcohol; less soluble in Absolute Alcohol; nearly insoluble in Ether, Chloroform and Benzene.

Dose, 0.0003 gm. = 0.3 milligm. ($\frac{1}{2000}$ gr.).

ACTION.

It is essentially a muscle poison, in sufficient doses causing stiffness of the limbs and afterward complete loss of voluntary movement; in toxic amounts it paralyzes the muscles by direct contact through the blood, and when contractility has once been destroyed by its action, no stimulus will re-excite it. The heart, receiving, as it does, a larger supply of blood than other muscles, is promptly and decidedly influenced; and by proper regulation of the dose it is possible to secure action on this organ while the muscles in general remain practically unaffected. In moderate amounts strophanthus has the same effect on the heart as digitalis, stimulating the tonic contraction of the cardiac muscle, increasing the force of the ventricular systole, prolonging the diastole, lowering and regulating the rhythm, and causing a pronounced, though slow, rise of blood-pressure. The most important point of difference between the two drugs is that the constriction of the peripheral arteries is considerably less marked under strophanthus than under digitalis. Strophanthus is an efficient diuretic; its active principle is readily eliminated in the urine, but as its excretion is somewhat slower than its absorption, there is an overlapping of effect when the dose is too frequently repeated. It does not

ordinarily cause gastro-intestinal derangement, and small doses are stomachic.

Uses.

To fulfil the same indications as digitalis; on the heart it acts more promptly, though probably less permanently than the latter. The advantages of strophanthus over digitalis are as follows: (1) Greater rapidity of action; (2) less marked vaso-constrictor effects; (3) greater diuretic power; (4) no disturbance of digestion from properly made preparations; (5) absence of so-called cumulation; (6) greater value in children; (7) greater safety in the aged.

CONVALLARIA.

CONVALLARIA. *Synonym.*—Lily of the Valley. The dried rhizome and roots of *Convallaria majalis* Linné (Fam. *Liliaceæ*). *Habitat.*—United States, in the Allegheny Mountains; Europe and Northern Asia.

Characters.—Rhizome of horizontal growth, somewhat branched, length variable, 1 to 3 mm. thick, cylindrical, whitish or pale brown, marked with few circular stem-scars and at each joint with a circle of root-scars or thin, tortuous and branched roots; fracture fibrous, but weak; internally whitish; odor distinct; taste sweetish, bitter and slightly acrid.

Composition.—The chief constituents are—(1) *Convallamarin*, $C_{46}H_{44}O_{24}$, a glucoside the active principle; a white, bitter-sweet powder, soluble in water and Alcohol. (2) *Convallarin*, $C_{34}H_{31}O_{11}$, a glucoside, in acrid prisms, sparingly soluble in, but foaming with water, soluble in Alcohol, but not in Ether. This is said only to purge.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparation.

Fluidextractum Convallariæ.—Fluidextract of Convallaria. By maceration and percolation with Alcohol, and evaporation.

Dose, 0.5 c.c. (8 ♏).

Action.

Cathartic; diuretic; at first slows the heart and raises the arterial tension, subsequently the pulse is somewhat quickened.

Uses.

In the same class of cases as digitalis; it is free from most of the undesirable effects of the latter, but appears to be very unreliable.

SCILLA.

SQUILL. *Synonym.*—Sea Onion. The bulb of *Urginea maritima* (Linné) Baker (Fam. *Liliaceæ*), deprived of its dry, membranaceous outer scales, and cut into thin slices and carefully dried, the central portions being rejected. *Habitat.*—Basin of the Mediterranean near the sea.

CHARACTERS.—In irregular, more or less curved, somewhat translucent, yellowish-white or reddish-white curved segments, 3 to 5 cm. long, brittle and pulverizable when dry, tough and flexible when damp; odor slight; taste mucilaginous, bitter and acrid.

COMPOSITION.—The chief constituents are—(1) *Scilliloxin*, the most active principle; (2) *Scillipicrin*, acting upon the heart; (3) *Scillin*, producing numbness and vomiting; (4) Mucilage.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

Preparations.

1. **Acetum Scillæ.**—Vinegar of Squill. Squill, 100; Diluted Acetic Acid, by maceration and percolation, to 1000.

Dose, 1 c.c. (15 ♏).

2. **Fluidextractum Scillæ.**—Fluidextract of Squill. By maceration and percolation with Acetic Acid and Water.

Dose, 0.1 c.c. (1½ ♏).

3. **Syrupus Scillæ.**—Syrup of Squill. Vinegar of Squill, 450; Sugar, 800; water to 1000. By solution and straining.

Dose, 2 c.c. (30 ♏).

4. **Syrupus Scillæ Compositus.**—Compound Syrup of Squill. *Synonym.*—Hive Syrup. Fluidextract of Squill, 80; Fluidextract of Senega, 80; Antimony and Potassium Tartrate, 2; Sugar, 750; Purified Talc, 20; water to 1000.

Dose, 2 c.c. (30 ♏).

5. **Tinctura Scillæ.**—Tincture of Squill. Squill, 100. By maceration and percolation with Alcohol and Water, to 1000.

Dose, 1 c.c. (15 ♏).

ACTION.

Expectorant; diuretic; a violent gastro-intestinal irritant; affects the heart and arterial system in the same manner as digitalis, but its effects are less marked and less persistent.

USES.

Subacute and chronic bronchitis; emphysema; cardiac disease, with or without dropsy, in association with other remedies;

dropsy not dependent on renal disease—in the latter it is too irritating to the kidneys.

SCOPARIUS.

SCOPARIUS. *Synonym.*—Broom. The dried tops of *Cytisus Scoparius* (Linné) Link (Fam. *Leguminosæ*). *Habitat.*—Western Asia, Southern and Western Europe; naturalized in some localities in the United States.

CHARACTERS.—Thin, flexible, branched twigs, 2 to 3 mm. thick; externally dark green, with five wings and numerous reddish-brown cork patches; internally yellowish; younger branches somewhat pubescent; fracture short-fibrous, that of thick pieces tough and splintery; usually free from the simple, obovate leaves; odor peculiar when bruised; taste disagreeably bitter.

COMPOSITION.—The chief constituents are—(1) *Scoparin*, $C_{21}H_{22}O_{10}$, a tasteless, amorphous, neutral principle. (2) *Sparteine*, $C_{15}H_{26}N_2$, a colorless, oily, very bitter alkaloid. (3) Tannic Acid.

Dose, 1 gm. (15 gr.).

SPARTEINÆ SULPHAS.—Sparteine Sulphate. $C_{15}H_{26}N_2H_2SO_4 + 5H_2O = 419.26$. The sulphate $[SO_2(OH)_2 \cdot C_{15}H_{26}N_2 + 5H_2O]$ of an alkaloid obtained from Scoparius. It should be kept in well-stoppered, amber-colored vials.

SOURCE.—It is obtained by exacting the plant with water acidulated with Sulphuric Acid, concentrating, decomposing with Sodium Hydroxide, and distilling. The Sulphate is prepared from the alkaloid by neutralization with Sulphuric Acid, and crystallization.

CHARACTERS.—Colorless, rhombohedral crystals, or a crystalline powder, odorless, and having a slightly saline and somewhat bitter taste. It is hygroscopic, and its aqueous solution has an acid reaction. *Solubility.*—In 1.1 parts of water and 2.4 of Alcohol; insoluble in Ether and Chloroform.

IMPURITIES.—Ammonium salts, sugar and other readily carbonizable organic matters.

Dose, 0.010 gm. = 10 milligm. ($\frac{1}{6}$ gr.).

ACTION.

Diuretic; sparteine paralyzes the respiratory and motor centres and causes a marked increase in the size and height of the cardiac wave.

USES.

As a diuretic in dropsy from heart disease or chronic nephritis. Sparteine is useful in uncompensated cardiac, especially mitral, disease.

CAMPHORA.

CAMPHOR. $C_{10}H_{16}O = 150.98$. *Synonyms.*—Gum Camphor. Laurel Camphor. The dextrogyrate modification of the saturated ketone (C_9H_{16}-CO), obtained from *Cinnamomum Camphora* (Linné) Nees et Ebermaier (Fam. *Lauraceæ*), and purified by sublimation. *Habitat.*—China and Japan.

SOURCE.—The branches and chipped wood are exposed to the vapors of boiling water, the volatilized Camphor is condensed, drained and pressed from the adherent volatile oil (Oil of Camphor), and subsequently refined by sublimation in vessels of glass or iron. Camphor is now obtained by tapping the trees and collecting the exudation.

CHARACTERS.—White, translucent masses, of a tough consistence and a crystalline structure, readily pulverizable in the presence of a little Alcohol, Ether, or Chloroform; having a penetrating, characteristic odor, and a pungently aromatic taste. Sp. gr., 0.990. Burns with a smoky flame. Volatilizes slowly at ordinary temperatures. Sublimes entirely when heated. *Solubility.*—Very sparingly soluble in water, but readily in Alcohol, Ether, Chloroform, Carbon Disulphide, Petroleum Benzin, and fixed and volatile oils. When Camphor is triturated, in about molecular proportions, with Menthol, Thymol, Phenol, or Hydrated Chloral, liquefaction ensues.

COMPOSITION.—Camphor is an oxidation product of Pinene (*see* p. 390), and may also be derived from Cymene found in Oil of Caraway and Oil of Eucalyptus. The official campho ris called Laurel Camphor. Borneol, known as Borneo, Sumatra or Barus Camphor, often in commerce substituted for the official camphor, which it closely resembles, is derived from *Dryobalanops Camphora*, and known from the official variety by sinking in water. It is $C_{10}H_{18}O$; that is to say, an alcohol. The common form of Borneol is dextro-rotary, but lævo-rotary and inactive varieties are known.

IMPURITY.—Chlorinated products.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

Camphor is contained in Ceratum Plumbi Subacetatis, Linimentum Belladonnæ, Linimentum Saponis, Tinctura Opii Camphorata, and Pulvis Morphinæ Compositus.

Preparations.

1. **Aqua Camphoræ.**—Camphor Water. Camphor, 8; by trituration with Alcohol, 8; and Purified Talc, 15; addition of Distilled Water, and filtration to 1000.

Dose, 8 c.c. (2 fl. dr.).

2. **Ceratum Camphoræ.**—Camphor Cerate. Camphor Liniment, 100; White Wax, 350; White Petrolatum, 150; Benzoated Lard, 400.

3. Linimentum Camphoræ.—Camphor Liniment. *Synonym.*—Camphorated Oil. Camphor, 200; Cotton Seed Oil, 800.

4. Spiritus Camphoræ.—Spirit of Camphor. Camphor, 100; Alcohol to 1000. By solution and filtration.

Dose, 1 c.c. (15 ♏).

CAMPHORA MONOBROMATA.—Monobromated Camphor, $C_{10}H_{15}BrO = 229.34$. A substitution product of Camphor ($C_9H_{15}Br\ CO$).

SOURCE.—By heating Bromine and Camphor, at 77.7° C. (172° F.), solution in Benzin, and re-crystallization from hot Alcohol. $C_{10}H_{16}O + 2Br = C_{10}H_{15}BrO + HBr$.

CHARACTERS.—Colorless, prismatic needles or scales, having a mild, camphoraceous odor and taste, permanent in the air, unaffected by light, and neutral to litmus paper. *Solubility.*—Almost insoluble in water; freely soluble in Alcohol, Ether, Chloroform, hot Petroleum Benzin, and fixed and volatile oils; slightly soluble in Glycerin. It is also soluble without decomposition in cold, concentrated Sulphuric Acid, from which it separates again unaltered, when the solution is poured into water.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

ACIDUM CAMPHORICUM.—Camphoric Acid. $H_2C_{10}H_{14} = 198.62$. A dibasic organic acid ($C_8H_{14}(COOH)_2$), obtained by oxidation.

SOURCE.—From Camphor by oxidation with Nitric Acid.

CHARACTERS.—Colorless, odorless, monoclinic, prismatic crystals or plates. *Solubility.*—In 125 parts of water and 10 parts of boiling water; readily in Alcohol; less soluble in Ether and Chloroform; soluble in fatty oils.

IMPURITY.—Nitric acid.

Dose, 1 gm. (15 gr.).

ACTION.

It is a cutaneous stimulant and anæsthetic; internally it is stomachic, carminative, antiseptic, and a cardiac, cerebral and medullary stimulant. Large doses cause delirium with hallucinations and epileptiform convulsions, which are followed by collapse. In fever it has some antipyretic action.

USES.

Externally as a counter-irritant and anodyne; internally in vomiting, flatulence, diarrhœa, acute coryza, bronchitis, emphysema, so-called typhoid pneumonia, typhus and typhoid fever, the strangury caused by cantharides, nervousness and hysteria,

nervous dysmenorrhœa, after-pains, and delirium tremens; by enema for thread-worms. It is an excellent remedy for the night-sweats of chronic tuberculosis.

Unofficial Preparations.

Erythrophlœum.—Sassy Bark. *Synonyms.*—Mancona Bark. Ordeal Bark. Casca Bark. The bark of *Erythrophlœum guineense* (Fam. *Leguminosæ*). *Habitat.*—Africa.

CHARACTERS.—In flat or curved pieces of irregular size, about 6 mm. thick, covered externally with an uneven warty and fissured corky layer, or deprived of the same, of a dull brown color. It is hard, brittle, of a fibrous texture, internally with pale yellowish-brown spots, inodorous, of an astringent, somewhat bitter and acrid taste, and when powdered excites sneezing.

COMPOSITION.—The active principle is *Erythrophlœine* (*see* below).

Preparation.

Tinctura Erythrophlœi.—Tincture of Erythrophlœum. Contains 10 per cent. of the drug.

Dose, 0.30 to 0.60 c.c.; 5 to 10 ♏.

Erythrophlœina.—Erythrophlœine. A colorless crystalline alkaloid, soluble in Alcohol, water and Acetic Ether; nearly insoluble in Chloroform and Ether.

Dose, 0.0015 to 0.0020 gm.; $\frac{1}{40}$ to $\frac{1}{32}$ gr.

ACTION.

The heart is at first slowed, but later accelerated and weakened; the blood-pressure rises and afterwards falls; the respiratory movements are at first slower and fuller, but grow quick and irregular when the heart becomes feeble. It is a vaso-constrictor, and upon the vagus its action resembles that of digitalis. Its ability to slow the heart is somewhat greater than that of digitalis, but it is a more decided gastric irritant. The alkaloid is locally anæsthetic, but its application to the eye causes dimness of the cornea, myosis, headache, giddiness and even syncope.

USES.

Cardiac disease, with or without dropsy; the indications for its employment are identical with those for digitalis.

Adonidinum.—Adonidin. A glucoside obtained from *Adonis Vernalis* (Fam. *Ranunculaceæ*). *Synonym.*—False Hellebore. *Habitat.*—Northern Europe and Asia.

CHARACTERS.—This glucoside occurs as a somewhat hygroscopic, canary-colored powder, of intensely bitter taste; soluble in water and Alcohol; insoluble in Ether, Chloroform and Petroleum Benzin.

Dose, .01 to .02 gm.; ⅙ to ⅓ gr.

ACTION.

The same as digitalis, though adonidin is more prompt in its effects. It sometimes causes considerable gastro-intestinal irritation. It is rapidly eliminated, and therefore does not appear to have any cumulative tendency.

USES.

In the same class of cases as digitalis. It has been found less certainly beneficial in valvular disease of the heart than the latter, but may prove a satisfactory substitute for it in cases in which that drug is not well borne; also, as its action is more prompt, adonidin sometimes serves a useful purpose in beginning the regulation of the cardiac movements before digitalis has had time to produce its effect.

CLASS II.—THE ACONITE GROUP, DECREASING THE FREQUENCY AND FORCE OF THE BEAT OF THE HEART.

Aconite, Aconitine, Veratrum, Veratrine.

ACONITUM.

ACONITE. *Synonyms.*—Monkshood. Wolfsbane. The dried tuberous root of *Aconitum Napellus* Linné (Fam. *Ranunculaceæ*), collected in autumn. It should yield not less than 0.5 per cent. of Aconitine. *Habitat.*—Mountainous districts of Europe, Asia, and Northwestern North America.

CHARACTERS.—Slenderly conical, 4 to 10 cm. long, 10 to 20 mm. thick at the crown; occasionally split; longitudinally wrinkled; dark brown and marked with coarse whitish root-scars; fracture short, horny or mealy; internally whitish or light brown; the cambium zone irregular and 5- to 7-angled; odor very slight; taste sweetish, soon becoming acrid, and developing a tingling sensation, followed by numbness. *Resembling Aconite.*—Horseradish.

COMPOSITION.—The active principle is the very poisonous alkaloid *Aconitine* (*see* below). Two other alkaloids are present—*Aconine*, $C_{26}H_{39}O_{11}$, and *Benzaconine*. Other principles are, perhaps, *Pseudaconitine*, $C_{36}H_{49}NO_{11}$, or Napelline (dose, .01 to .03 gm.; $\frac{1}{6}$ to $\frac{1}{2}$ gr., Merck), *Pseudoaconine*, $C_{27}H_{41}NO_8$, *Picro-aconitine*, $C_{31}H_{45}NO_{10}$, combined with Aconitic Acid, $H_3C_6H_3O_6$.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

1. Flu… tract of Aconite. By macerati… and water, and evaporation.

Dose, 0

2. Tin… Aconite. Aconite, 1…0. By mace… hol and Water to 1000.

Dose, 0.0 c.c. (…).

It should be remembered that Fleming's Tincture of Aconite, which is found in the shops, is nearly seven times stronger than the official.

ACONITINA.—Aconitine. $C_{34}H_{47}NO_{12} = 640.55$. An Alkaloid obtained from Aconite.

SOURCE.—It is precipitated from an aqueous solution of an alcoholic extract of the powdered root by Ammonia, and then purified.

CHARACTERS.—Colorless or white rhombic tables or prisms, odorless, permanent in the air, and producing, in extremely diluted solutions, a characteristic tingling sensation when brought in contact with the mucous surfaces of the tongue or lips. *The alkaloid itself should never be tasted, and its solutions only when largely diluted, and then with the utmost caution.* By partial hydrolysis it yields Benzaconine, and on further hydrolysis it forms Aconine and Benzoic Acid. *Solubility.*—In 3200 parts of water, 22 of Alcohol, 44 of Ether, and 5.6 parts of Benzene; very soluble in Chloroform.

IMPURITIES.—Pseudaconitine, atropine.

INCOMPATIBLES.—Those common to all alkaloids. *See* Atropine.

Dose, 0.00015 gm. = 0.15 milligm. ($\frac{1}{400}$ gr.).

Unofficial Preparation.

Unguentum Aconitinæ.—Aconitine Ointment. Aconitine dissolved in Alcohol, 1; Oleic Acid, 8; Benzoinated Lard, 41.

ACTION.

First stimulates and then paralyzes the sensory nerves, causing tingling, burning, numbness and finally anæsthesia; also succes-

sively stimulates and paralyzes all the parts of the heart's organism, and there is always in the end a complete fall of blood-pressure from paralysis of the heart and vessels. The peripheral vessels and the pupil are dilated. Clonic convulsions may be excited, but the motor nerves are not affected until after the sensory nerves. Moderate doses usually have the effect of quieting the respiratory movements, but large amounts paralyze the respiratory centre in the medulla, and this paralysis begins early and progresses rapidly. The temperature is markedly reduced by aconite. Profuse diaphoresis is commonly caused by it, but it has only a moderate diuretic effect.

Uses.

Externally, neuralgia; myalgia; gout; chronic rheumatism; prurigo; pruritus; papular eczema; herpes zoster; chilblains. Internally, in fevers and in the early stages of acute inflammatory affections, especially of the organs of respiration, when the type of the disease is not adynamic. It is contra-indicated in typhoid and other continued fevers of an asthenic character and also in inflammatory conditions of the gastro-intestinal mucous membrane. In conditions in which there is high arterial tension, chiefly of cardiac origin, aconite is a remedy of great value; it may also be of service in simple nervous palpitation of the heart, epistaxis and congestive dysmenorrhœa, and to relieve the pain of aneurism.

Toxicology.—Empty the stomach with the stomach pump or tube; keep patient flat on his back with the feet elevated; artificial respiration; external warmth; tannic acid; stimulation by the hypodermatic use of ether, alcohol and digitalis successively; also strychnine in full doses. If the case seems to require it, ammonia may be injected into the veins, and the inhalation of amyl nitrite may be cautiously employed. Other agents which partially antagonize the effects upon the heart and respiration are caffeine and atropine.

VERATRUM.

VERATRUM. *Synonym.*—Hellebore. The dried rhizome and roots of *Veratrum viride* Aiton (American Hellebore) or *Veratrum album* Linné (White Hellebore) (Fam. *Liliaceæ*). *Habitat.*—North America, in rich woods.

Characters.—Rhizome upright, obconical, or ovoid, from 2.5 to 7 cm

long, and 2 to 5 cm. thick, externally light to dark brown or blackish; internally grayish-white, showing numerous short, irregular wood-bundles. Roots emanating from all sides of the rhizome, numerous, shriveled, whitish or light yellowish-brown, about 10 to 20 cm. long, and 2 mm. thick. Inodorous, but strongly sternutatory when powdered; taste bitterish and very acrid. *Resembling Veratrum.*—Valerian, Serpentaria, and Arnica, but Veratrum has thicker rootlets, and no odor.

COMPOSITION.—The chief constituents are—(1) *Jervine*, $C_{26}H_{37}NO_3$, an alkaloid, non-sternutatory. (2) *Veratrine* (Cevadine), $C_{32}H_{49}NO_9$, a powerful alkaloid which occurs in two forms, one crystalline and the other amorphous. (3) *Protoveratrine*, $C_{32}H_{51}NO_{11}$, almost rivaling Aconitine in its toxicity. (4) *Pseudojervine*, an alkaloid, resembling Jervine. (5) *Rubijervine*, uncrystallizable, and sternutatory. (6) *Resin.*

Dose, 0.125 gm. =125 milligm. (2 gr.).

Preparations.

1. Fluidextractum Veratri.—Fluidextract of Veratrum. By maceration and percolation with Alcohol, and evaporation.

Dose, 0.1 c.c. (1½ ♏).

2. Tinctura Veratri.—Tincture of Veratrum. Veratrum, 100. By maceration and percolation, with Alcohol to 1000.

Dose, 1 c.c. (15 ♏).

It should be remembered that Norwood's Tincture of Veratrum, which is found in the shops, is four and one-half times stronger than the official.

ACTION.

On the skin it causes tingling, numbness and anæsthesia, and, applied to the mucous membrane of the nose and throat, violent sneezing and coughing. Internally it produces gastro-intestinal irritation, prolonged relaxation of striped and cardiac muscle, reduction of arterial pressure, depression of respiration, convulsions from stimulation of the spinal cord, free diaphoresis, and reduction of temperature. After lethal doses death usually results from paralysis of the respiration.

USES.

As a circulatory depressant, given early, in croupous pneumonia, pleurisy, hepatitis, maniacal delirium, etc., with strong, bounding pulse and other sthenic conditions; in puerperal convulsions and the early stage of peritonitis, phlebitis and other inflammatory affections of the puerperal state; also acute rheu-

matism, tonsillitis, aneurism, and wounds of the head, pericardium and peritoneum.

VERATRINA.

VERATRINE.—A mixture of alkaloids obtained from the seed of *Asagræa officinalis* (Chamisso and Schlechtendal) Lindley (Fam. *Liliaceæ*). *Habitat.*—Mexico to Venezuela.

SOURCE.—(1) The seed is exhausted with Alcohol, and the Alcohol recovered by distillation. (2) The residuary liquid is diluted with water to precipitate the resins and filtered. (3) Ammonia is added to the filtrate when veratrine is precipitated. (4) It is then re-dissolved, decolorized, and re-precipitated.

CHARACTERS.—A white or grayish-white, amorphous powder, odorless, but causing intense irritation and sneezing when even a minute quantity reaches the nasal mucous membrane; having an acrid taste, and leaving a sensation of tingling and numbness on the tongue; slightly hygroscopic in moist air. *It should be tasted with great caution. Solubility.*—In 1750 parts of water, 2.2 of Alcohol, 3 of Ether, and in 1 part of Chloroform; very soluble in Benzene and Amyl Alcohol.

Dose, 0.002 gm. = 2 milligm. ($\frac{1}{30}$ gr.).

Preparations.

1. Oleatum Veratrinæ.—Oleate of Veratrine. Veratrine, 2; Oleic Acid, 50; Olive Oil, to 100.

2. Unguentum Veratrinæ.—Veratrine Ointment. Veratrine, 4; Expressed Oil of Almond, 6; Benzoinated Lard, 90.

ACTION.

The same as veratrum viride, which owes its activity to veratrine.

USES.

Chiefly employed in the external treatment of neuralgia, myalgia, acute gout, and other painful affections.

CLASS III.—THE CACTUS GROUP, INCREASING THE FREQUENCY AND FORCE OF THE BEAT OF THE HEART.

CACTUS.

Unofficial Preparations.

Cactus.—Cereus Grandiflorus. *Synonym.*—Night-blooming Cereus. The stems of *Cactus grandiflorus* Linné (Fam. *Cactaceæ*). *Habitat.*—Tropical America; cultivated.

CHARACTERS.—Its branches, or stems, are scandent, diffuse, radicant, slightly 5 to 7 angular; areolæ 5 to 12 spinulose; spinules short, 4 to 6 mm. long, nearly equaling the whorl; flowers large, nocturnal, white, pleasantly and strongly fragrant; the calyx is about 15 to 20 cm. in diameter; the inside being of a splendid yellow, the outside is of a dark brown; the petals of a pure white; and there is a vast number of recurved stamens in the centre.

CONSTITUENT.—It is believed to contain an alkaloid, *Cactine*, but this has not been satisfactorily demonstrated.

Preparation.

Fluidextractum Cacti.—Fluidextract of Cactus. By maceration and percolation of the fresh flowering branches with Alcohol and Water, and evaporation.

Dose, .60 to 2 c.c.; 10 to 30 ♏.

ACTION.

Cactus shortens the ventricular diastole, thus quickening the pulse, and increases the blood-pressure.

USES.

Cardiac weakness (relative incompetency); simple eccentric cardiac dilatation; functional cardiac diseases; "slow heart" from over-stimulation of the pneumogastric or degeneration of the ventricular muscular wall; aortic regurgitation; convalescence from typhoid fever; dyspepsia; neurasthenia of the climacteric; sexual exhaustion. It is contra-indicated in mitral stenosis.

Class I of the Volatile Oils also act upon the heart.

GROUP III.—Drugs Employed for their Action on the Respiratory Organs.

Senega, Sanguinaria, Ipecac, Lobelia, Eriodictyon, Wild Cherry, Laurocerasus, Bitter Almond, Cocillaña.

SENEGA.

SENEGA. *Synonym.*—Senega Snakeroot. The dried root of *Polygala Senega* Linné (Fam. *Polygalaceæ*). *Habitat.*—United States, westward to Minnesota.

CHARACTERS.—Somewhat cylindrical, tapering, more or less flexuous,

3 to 15 cm. long and 2 to 8 mm. thick, bearing several similar, horizontal branches and a few rootlets; crown knotty, with numerous buds and short stem-remnants; externally yellowish-gray or brownish-yellow, longitudinally wrinkled, usually marked by a keel which is more prominent in perfectly dry roots near the crown; fracture short, wood light yellow, usually excentrically developed; odor slight, nauseating; taste sweetish, afterwards acrid. *Resembling Senega root.*—Arnica, Valerian, Serpentaria and Green Hellebore, but none of these have a keel.

COMPOSITION.—The active principle is *Senegin* ($C_{32}H_{54}O_{18}$). Also called *Saponin*, which is found in Quillaja (*q.v.*). It is a colorless, amorphous glucoside, insoluble in Alcohol, but forming a soapy emulsion when mixed with boiling water, and is decomposed by Hydrochloric Acid into glucose and *Sapogenin*. It exists as a white powder, which forms a soapy emulsion when mixed with boiling water. It acts like Digitonin (*see* p. 250) and is found in many plants.

IMPURITIES.—Other roots are mixed with it.

Dose, 1 gm. (15 gr.).

Preparations.

1. Fluidextractum Senegæ.—Fluidextract of Senega. By maceration and percolation with Solution of Potassium Hydroxide, Alcohol and Water, and evaporation.

Dose, 1 c.c. (15 ♏).

2. Syrupus Scillæ Compositus.—Compound Syrup of Squill. Fluidextract of Squill, 80; Fluidextract of Senega, 80; Antimony and Potassium Tartrate, 2; Sugar, 750; Purified Talc, 20; water to 1000.

Dose, 2 c.c. (30 ♏).

3. Syrupus Senegæ.—Syrup of Senega. Fluidextract of Senega, 200; Syrup, 800.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

It is a sternutatory, sialagogue, stimulating expectorant, gastro-intestinal irritant, and diuretic. Senegin is excreted through the bronchial mucous membrane, and it is in the respiratory passages that the drug appears to exert its most important influence.

USES.

Chiefly in subacute and chronic bronchitis.

SANGUINARIA.

SANGUINARIA. *Synonym.*—Bloodroot. The dried rhizome of *Sanguinaria canadensis* Linné (Fam. *Papaveraceæ*), collected after the death of the foliage. *Habitat.*—North America in rich woods.

CHARACTERS. — Of horizontal growth, cylindrical, often somewhat branched, 2 to 7 cm. long, 5 to 15 mm. in diameter; externally reddish-brown, slightly annulate; fracture short, somewhat waxy, brownish-red or yellowish-white, with numerous reddish resin-cells; odor slight, the powder sternutatory; taste persistently acrid and bitter.

COMPOSITION.—Its chief constituents are—(1) *Sanguinarine*, $C_{20}H_{15}NO_4$, a white substance, soluble in Alcohol. (2) *Chelerythrine*, $C_{20}H_{15}NO_4$. (3) *Protopine*, $C_{22}H_{21}NO_5$ also present in Opium. (4) *Homochelidonine*, $C_{22}H_{21}NO_4$. (5) Resins. (6) Citric and Malic Acids.

Dose, 0.125 gm. (2 gr.).

Preparations.

1. **Fluidextractum Sanguinariæ.**—Fluidextract of Sanguinaria. By maceration and percolation with Acetic Acid and water, and evaporation.

Dose, 0.1 c.c. (1½ ♏).

2. **Tinctura Sanguinariæ.**—Tincture of Sanguinaria. Sanguinaria, 100; by maceration with Acetic Acid, 20; Alcohol and water, and percolation to 1000.

Dose, 1 c.c. (15 ♏).

ACTION.

Emetic; stimulant; expectorant; emmenagogue; in large doses narcotic.

USES.

As a stimulating expectorant in subacute and chronic bronchitis.

IPECACUANHA.

IPECACUANHA.—Ipecac. The dried root, to which may be attached a portion of the stem not exceeding 7 cm. in length, of *Cephaëlis Ipecacuanha* (Brotero) A. Richard (Fam. *Rubiaceæ*), known commercially as Rio,-Brazilian or Para Ipecac, or the corresponding portion of *Cephaëlis acuminata* Karsten, known commercially as Carthagena Ipecac; yielding, when assayed, not less than 1.75 per cent. of Ipecac alkaloids. *Habitat.*—Brazil to Bolivia and New Granada, in damp forests cultivated in India.

CHARACTERS. *Rio Ipecac.*—In pieces of irregular length, rarely exceeding 25 cm.; stem portion 2 to 3 mm. thick, light gray-brown, cylindrical and smoothish; root portion usually red-brown, occasionally blackish-brown, rarely gray-brown, 3 to 6 mm. thick, curved and sharply tortuous,

nearly free from rootlets, occasionally branched, closely annulated with thickened, incomplete rings, and usually exhibiting transverse fissures with vertical sides through the bark; fracture short, the very thick, easily separable bark whitish, usually resinous, the thin, tough wood yellowish-white, without vessels; odor very slight, peculiar, the dust sternutatory; taste bitter and nauseous, somewhat acrid.

Carthagena Ipecac.—Similar to Rio Ipecac, but about one-half thicker, dull-gray externally, with thinner, merging annulæ, and the fractured surface of the bark gray.

COMPOSITION.—The chief constituents are—(1) *Emetine*, $C_{30}H_{44}N_2O_4$, from 1 to 2 per cent., an uncrystallizable alkaloid. It is colorless (turns yellow on keeping), odorless, bitter, and soluble in Alcohol, Ether and Chloroform, slightly soluble in water, not in caustic alkali. (2) *Cephaëline*, $C_{28}H_{38}N_2O_4$, an amorphous, bitter alkaloid, colorless (turns yellow on keeping), soluble in caustic alkali, less soluble in Ether than Emetine, but freely in Alcohol and Chloroform. (3) A third alkaloid in minute quantities. (4) A mixture called *Cephaëlic* or *Ipecacuanhic Acid.* (5) Tannic acid, Volatile Oil, Starch, Gum, etc.

The proportion of each alkaloid varies in different specimens of the root, but as a rule there is twice as much Emetine as Cephaëline. Emetine hydrochloride and hydrobromide are in the market; a solution of either in sherry, 1 to 3840, is of about the same strength as Vinum Ipecacuanhæ.

IMPURITIES.—Hemidesmus, which is cracked, not annulated; almond powder, occasionally found mixed with powdered ipecacuanha root, gives the odor of hydrocyanic acid when moistened.

Dose (expectorant), **0.065 gm. = 65 milligm. (1 gr.)**; (emetic) **1 gm. (15 gr.).**

Ipecac is contained in Pilulæ Laxativæ Compositæ.

Preparations.

1. Fluidextractum Ipecacuanhæ.—Fluidextract of Ipecac. By maceration and percolation with Alcohol and Water, distillation of the Alcohol, addition of water to residue, evaporation and addition of Alcohol.

Dose (emetic), **1 c.c. (15 ♏)**; (expectorant) **0.05 c.c. (1 ♏).**

Fluidextract of Ipecacuanha is used in Mistura Rhei et Sodæ.

2. Pulvis Ipecacuanhæ et Opii.—Powder of Ipecac and Opium. Powdered Opium, 10; Ipecac, 10; Sugar of Milk, 80.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

3. Syrupus Ipecacuanhæ.—Syrup of Ipecac. Fluidextract of Ipecac, 70; Acetic Acid, 10; Glycerin, 100; Sugar, 700; Water to 1000.

Dose (expectorant), **1 c.c. (15 ♏)**; (emetic) **15 c.c. (4 fl. dr.).**

4. Tinctura Ipecacuanhæ et Opii.—Tincture of Ipecac and Opium. Tincture of Deodorized Opium, 1000; Fluidextract of Ipecac, 100; Diluted Alcohol, a sufficient quantity, to make 1000. By evaporation and filtration.

Dose, 0.5 c.c. (8 ♏).

5. Vinum Ipecacuanhæ.—Wine of Ipecac. Fluidextract of Ipecac, 100; Alcohol, 100; White Wine, 800.

Dose, 1 c.c. (15 ♏).

Action.

Antiseptic; irritant; hæmostatic; expectorant; in small doses, stomachic, in large doses powerfully emetic; diaphoretic; cholagogue.

Uses.

As an emetic, especially for the purpose of clearing the passages in diseases of the respiratory organs and for relieving the stomach of undigested food; in small doses as a stomachic and to check vomiting; dysentery; catarrhal jaundice; diarrhœa, especially when associated with hepatic derangement; bronchitis, winter cough, emphysema and fibroid phthisis; as a diaphoretic in acute rheumatism, suppression of menstruation, chills, and the early stages of catarrh of the respiratory passages and of mild feverish attacks in general; hæmoptysis and other hæmorrhages.

LOBELIA.

LOBELIA. *Synonym.*—Indian Tobacco. The dried leaves and tops of *Lobelia inflata* Linné (Fam. *Campanulaceæ*), collected after a portion of the capsules have become inflated. *Habitat.*—North America, in the fields and open woods.

Characters.—Leaves alternate, the lower short-petioled, the upper sessile, ovate or oblong, 4 to 9 cm. long; irregularly serrate-denticulate, the divisions with a yellowish-brown, gland-like apex; pale green, pubescent; stems coarsely angled, often purplish, hairy, terminating in long racemes of small short-pedicelled flowers having an adherent 5-toothed calyx and a small tubular corolla, cleft to the base on the upper side, the one-sided limb 5-lobed, and pale blue in the fresh state, the five stamens united; capsule inflated, 2-celled, containing numerous minute brownish, ellipsoidal, coarsely reticulate seeds; odor slight, irritating; taste strongly acrid.

Composition.—The chief constituents are—(1) *Lobeline*, an alkaloid, as a yellowish, oily liquid of pungent taste, having an odor resembling that

of tobacco. (2) *Lobelacrin* (probably Lobeline Lobelate). (3) Lobelic Acid.

INCOMPATIBLES.—Caustic alkalies, as they decompose lobeline.

Dose, 0.5 gm. (7½ gr.).

Preparations.

1. **Fluidextractum Lobeliæ.**—Fluidextract of Lobelia. By maceration and percolation with Acetic Acid and Water, and evaporation.

Dose, 0.5 c.c. (8 ♏).

2. **Tinctura Lobeliæ.**—Tincture of Lobelia. Lobelia, 100. By percolation with diluted Alcohol to 1000.

Dose (expectorant), **1 c.c. (15 ♏); (emetic) 4 c.c. (1 fl. dr.).**

ACTION.

It is a powerful gastro-intestinal irritant. The pulse-rate is at first slowed and afterwards accelerated, and the blood-pressure, which is primarily depressed, subsequently rises beyond the normal; as a result of the vomiting produced, however, marked variations in the rate of the heart and in the arterial tension are apt to occur. Small doses stimulate and large doses paralyze the respiratory centre and the vagus terminations in the muscular coat of the bronchi or in ganglia in the lungs; under toxic amounts death occurs from respiratory failure, and convulsions or coma frequently result from the asphyxia. Lobelia is credited with diuretic and diaphoretic effects.

USES.

Externally, acute epididymitis; poison ivy eruption. Internally, asthmatic attacks; bronchitis; habitual constipation from atony of the muscular layer of the intestine; fæcal impaction; intussusception; strangulated hernia.

ERIODICTYON.

ERIODICTYON. *Synonyms.*—Yerba Santa. Mountain Balm. The dried leaves of *Eriodictyon californicum* (Hooker and Arnott) Greene (Fam. *Hydrophyllaceæ*). *Habitat.*—California.

CHARACTERS.—Usually occurring in fragments; entire leaf oblong-anceolate, 5 to 15 cm. long and 1 to 3 cm. broad, acute at the apex, narrowed below into a short, broad petiole, the margin more or less incurved, entire

or irregularly serrate, or crenate-dentate; upper surface yellowish-green, smooth, covered with a brownish resin; lower surface whitish or yellowish-white, conspicuously reticulated and densely tomentose; brittle, but flexible in a damp and warm atmosphere; odor somewhat aromatic; taste balsamic and sweetish.

COMPOSITION.—The chief constituents are—(1) Volatile Oil. (2) Resin, acrid, greenish-yellow, containing *Ericolin*, $C_{34}H_{56}O_{21}$. (3) Tannic acid, 8 per cent.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Eriodictyi.—Fluidextract of Eriodictyon. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 1 c.c. (15 ♏).

ACTION.

It is a bitter tonic and stimulant expectorant.

USES.

Chronic bronchitis; spasmodic attacks; as a vehicle for quinine.

PRUNUS VIRGINIANA.

WILD CHERRY.—The bark of *Prunus serotina* Ehrhart (*Prunus Virginiana* Miller) (Fam. *Rosaceæ*), which should be collected in autumn and carefully dried and preserved. *Habitat.*—North America, westward to Minnesota and Louisiana; in woods.

CHARACTERS.—Usually in transversely curved pieces from 3 to 7 cm. long, 0.5 to 4 mm. thick; outer surface pale green to greenish-brown, smooth, with numerous lenticels; inner surface light brown, somewhat reticulately striate or fissured; fracture short, granular; having a bitter-almond-like odor when macerated in water; taste astringent, aromatic and agreeably bitter.

COMPOSITION.—(1) *Amygdalin*, which yields with water, Glucose, Hydrocyanic Acid (*see* p. 100), and the Essential Oil of Bitter Almond. (2) *Emulsin*, probably identical with the emulsin of Bitter Almond. The action of this ferment is destroyed at a boiling temperature. (3) Tannic Acid.

Dose, 2 gm. (30 gr.).

Preparations.

1. **Fluidextractum Pruni Virginianæ.**—Fluidextract of Wild Cherry. By maceration and percolation with Glycerin, Alcohol and Water, and evaporation.

Dose, 2 c.c. (30 ♏).

2. Infusum Pruni Virginianæ.—Infusion of Wild Cherry. Wild Cherry, 40; Glycerin, 50; Water to 1000. By maceration and percolation.

Dose, 60 c.c. (2 fl. oz.).

3. Syrupus Pruni Virginianæ.—Syrup of Wild Cherry. Wild Cherry, 150; Sugar, 700; Glycerin, 150; Water to 1000. By maceration and percolation.

Dose, 4 c.c. (1 fl. dr.).

Action.

Sedative, and an aromatic bitter tonic.

Uses.

Atonic dyspepsia; chronic gastric catarrh; convalescence from acute diseases; bronchial troubles. The syrup is very largely employed as an ingredient of cough mixtures and as a vehicle.

Unofficial Preparation of Laurocerasus.

Aqua Laurocerasi.—Cherry Laurel Water. Made by distillation and standardized so that its strength is 0.1 per cent. of absolute Hydrocyanic Acid.

Incompatibles.—Metallic salts.

Dose, 2 to 8 c.c.; ½ to 2 fl. dr.

Action.

The same as that of diluted hydrocyanic acid.

Uses.

As a flavoring agent.

AMYGDALA AMARA.

BITTER ALMOND.—The ripe seed of *Prunus Amygdalus* Stokes, var. *amara* De Candolle (Fam. *Rosaceæ*). *Habitat.*—Western Asia; naturalized in the Mediterranean basin; cultivated.

Characters.—Ovate or oblong-lanceolate, 20 to 30 mm. long; seed-coat thin, brown, finely downy; embryo straight, white, with two plano-convex cotyledons; taste bitter and oily. When triturated with water, Bitter Almond yields a milk-white emulsion which emits an odor of Hydrocyanic Acid.

Composition.—The chief constituents are—(1) *Oleum Amygdalæ Expressum* (*see* p. 275), 45 per cent., the same fixed oil as in the sweet variety. (2) *Emulsin.* (3) *Amygdalin*, $C_{20}H_{27}NO_{11}$, a crystalline glucoside, having

a sweetish-bitter taste, which yields *Oleum Amygdalæ Amaræ*. It is very important to distinguish it from the *Oleum Amygdalæ Expressum*, which is harmless. The oil of bitter almond is usually very poisonous from admixture of Hydrocyanic Acid; for if moisture has had access to the glucoside Amygdalin, on which, in the presence of water, the emulsion in the almond acts as a ferment, the volatile oil of bitter almond (benzaldehyde), glucose and Hydrocyanic Acid (*see* p. 100) are formed. $C_{20}H_{27}NO_{11} + 2H_2O = C_7H_6O$ (the volatile oil) $+ HCN + 2C_6H_{12}O_6$. The oil when separated from the Hydrocyanic Acid is not poisonous and is used to flavor sweets. Care should be taken to avoid the poisonous artificial oil of bitter almond called Nitrobenzene. (*See* Benzaldehyde, p. 276.)

OLEUM AMYGDALÆ AMARÆ.—Oil of Bitter Almond. A volatile oil obtained from Bitter Almond and other seeds containing Amygdalin, yielding, when assayed, not less than 83 nor more than 85 per cent. of Benzaldehyde, and not less than 2 per cent. nor more than 4 per cent. of Hydrocyanic Acid.

SOURCE.—By maceration with water, and subsequent distillation.

CHARACTERS.—A clear, colorless or yellow, thin, and strongly refractive liquid, having a peculiar aromatic odor and a bitter and burning taste. Sp. gr., 1.045 to 1.060. *Solubility.*—In 300 parts of water; in Alcohol or Ether in all proportions and in an equal volume of 70 per cent. Alcohol; in Nitric Acid at ordinary temperatures, without the evolution of nitrous vapors.

IMPURITIES.—Hydrocyanic acid, chlorinated products, artificial oils. **Dose, 0.3 c.c.** (½ ♏).

Preparations.

1. Aqua Amygdalæ Amaræ.—Bitter Almond Water. Oil of Bitter Almond, 1; Distilled Water, 999. By solution and filtration.
Dose, 4 c.c. (1 fl. dr.).

2. Spiritus Amygdalæ Amaræ.—Spirit of Bitter Almond. *Synonym.*—Essence of Bitter Almond. Oil of Bitter Almond, 10; Alcohol, 800; Distilled Water, to 1000.
Dose, .5 c.c. (8 ♏).

3. Syrupus Amygdalæ.—Syrup of Almond. Spirit of Bitter Almond, 10; Orange Flower Water, 100; Syrup to 1000.
Dose, 4 c.c. (1 fl. dr.).

AMYGDALA DULCIS.

SWEET ALMOND.—*Synonym.*—Jordan Almond. The ripe seed of *Prunus Amygdalus* Stokes, var. *dulcis* De Candolle (Fam. *Rosaceæ*). *Habitat.*—Western Asia; naturalized in the Mediterranean basin; cultivated.

CHARACTERS.—Closely resembling the bitter almond (*see Amygdala Amara*), but usually broader, with lighter seed-coat, having a bland, sweetish taste and giving no odor of Hydrocyanic Acid when triturated with water.

COMPOSITION.—The chief constituents are—(1) *Oleum Amygdalæ Expressum* (*see* below), 56 per cent., a fixed oil. (2) *Emulsin*, and other albuminous bodies.

IMPURITY.—The bitter almond, giving an odor of Hydrocyanic Acid when rubbed with water.

Preparation.

Emulsum Amygdalæ.—Emulsion of Almond. *Synonym.*—Milk of Almond. Sweet Almond, 60; Acacia, 10; Sugar, 30; Water, to make 1000.

Dose, 120 c.c. (4 fl. oz.).

OLEUM AMYGDALÆ EXPRESSUM.—Expressed Oil of Almond.

SOURCE.—A fixed oil expressed from Bitter or Sweet Almond. It should be kept in well-stoppered containers, in a cool place.

CHARACTERS.—A clear, pale straw-colored or colorless, oily liquid, almost inodorous, and having a mild, nut-like taste. Sp. gr., 0.910 to 0.915. *Solubility.*—Only slightly soluble in Alcohol; soluble in Ether, Chloroform and Benzene in all proportions.

IMPURITIES.—Oils of apricot and peach kernels, olive, arachis, cotton seed, sesame and other fixed oils.

Dose, 30 c.c. (1 fl. oz.).

Expressed Oil of Almond is contained in Emulsum Chloroformi, Emulsum Olei Terebinthinæ, Unguentum Aquæ Rosæ, and Unguentum Veratrinæ.

ACTION.

The sweet almond is demulcent and nutritive; bitter almond, which differs from it in containing amygdalin, is poisonous in large quantities.

USES.

The emulsion is a soothing and emollient drink and a pleasant vehicle. Almond oil is used to a considerable extent in ointments. One of the most important medicinal uses of the sweet almond is in the form of bread and biscuits made from almond flour, which contains no starch and is a satisfactory substitute for wheat flour in the diet of diabetics.

BENZALDEHYDUM.

BENZALDEHYDE. $C_7H_6O = 105.25$. *Synonym.*—Benzoic Aldehyde. An aldehyde, produced synthetically, or obtained from natural Oil of Bitter Almond or other oils, and containing not less than 95 per cent. of pure Benzaldehyde ($C_6H_5 \cdot COH$). It should be kept in small amber-colored, well-stoppered bottles.

CHARACTERS.—A colorless, strongly refractive liquid, having a bitter-almond-like odor and a burning, aromatic taste. Sp. gr., about 1.045. *Solubility.*—Sparingly in water; soluble, in all proportions, in Alcohol, Ether, and fixed and volatile oils.

IMPURITIES.—Hydrocyanic acid and chlorinated products.

Dose, 0.03 c.c. (½ ♏).

ACTION.

Demulcent; nutritive.

USES.

Benzaldehyde made from toluene (C_7H_8) by heating benzyl chloride ($C_6H_5CHCl_2$), under pressure, with water or sulphuric acid (synthetic oil of bitter almond), has been found to be identical, chemically and physically, with the natural oil, and is employed for the same purposes. It possesses the advantages of uniformity of composition and freedom from hydrocyanic acid. False artificial oil of bitter almond, nitrobenzene, or oil of mirbane (made by the action of benzene on nitric acid), is very poisonous, and has been substituted for the natural or true synthetic oil with fatal results.

Unofficial Preparations.

Cocillaña.—Cocillaña. The bark of *Sycocarpus Rusbyi* (Fam. *Meliaceæ*). *Habitat.*—Bolivia.

CHARACTERS.—The bark is thick, and ash-colored, becoming rough only with considerable age; inner surface is grayish-yellow; the odor is slight, but peculiar; taste unpleasant (not bitter), slightly nauseous.

COMPOSITION.—Its chief constituents are—(1) *Rusbyine* (Eccles), an alkaloid. (2) *Two Resins.* (3) Tannic acid. (4) Calcium Oxalate.

Fluidextractum Cocillañæ.—Fluidextract of Cocillaña. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, .30 to 1.20 c.c.; 5 to 20 ♏.

Action.

Tonic; expectorant; laxative. It slightly strengthens the heart-beat, but does not stimulate the respiratory centre.

Uses.

It is of very great value as an expectorant; it is preferable to ipecacuanha in several respects and in many instances may be substituted with advantage for apomorphine, ammonium carbonate, and various other drugs used as expectorants.

Class II of the Volatile Oils also act on the Respiratory Organs.

GROUP IV.—Drugs having Antiperiodic, Antipyretic and Antiseptic Properties.

Cinchona, Quinine, Salicin, Salicylic Acid, Phenyl Salicylate, Methyl Salicylate, Oil of Gaultheria, Oil of Betula, Creosote, Guaiacol, Salophen.

CINCHONA.

CINCHONA. *Synonym.*—Peruvian Bark. The dried bark of *Cinchona Ledgeriana* Moens, *Cinchona Calisaya* Weddell, *Cinchona officinalis* Linné, and of hybrids of these with other species of *Cinchona* (Fam. *Rubiaceæ*). It should yield not less than 5 per cent. of total anhydrous Cinchona alkaloids, and at least 4 per cent. of anhydrous ether-soluble alkaloids when assayed. *Habitat.*—South America, on the Eastern slope of the central chain of the Andes, thence spreading northward into Colombia; cultivated in Java, India, Jamaica, and other countries; to a limited extent also in South America.

Characters.—In quills or curved pieces, of variable size, usually 2 or 3, sometimes 5 mm. thick; externally gray, rarely brownish-gray, with numerous intersecting transverse and longitudinal fissures, which have nearly vertical sides, the outer bark may be absent, the color externally being then cinnamon-brown; inner surface light cinnamon-brown, finely striate; fracture of the outer bark short and granular, of the inner finely splintery; powder light-brown or yellowish-brown; odor slight, aromatic; taste bitter and somewhat astringent.

Composition.—The chief constituents of Cinchona Bark are five alkaloids, two acids a glucoside, Tannic Acid, a coloring matter and a volatile oil.

(1) *Quinine.*—An alkaloid which exists as the hydroate; gives a green color with Chlorine water and Ammonia; turns the plane of polarization to the

left; solutions of its salts are fluorescent. It forms salts with acids. (*See* p. 81.)

(2) *Quinidine.*—An alkaloid, $C_{20}H_{24}N_2O_2$, isomeric with Quinine, differing from it only in crystallizing in prisms, turning the plane of polarization to the right, and not being soluble in Ammonia except in excess.

(3) *Cinchonine.*—An alkaloid. $C_{20}H_{24}N_2O$. Colorless prisms, inodorous, bitter. No green color with Chlorine Water and Ammonia. Turns the plane of polarization to the right. Not fluorescent.

(4) *Cinchonidine.*—An alkaloid, $C_{19}H_{22}N_2O$, isomeric with Cinchonine, differing from it in turning the plane of polarization to the left, being sparingly soluble in Ether, and being slightly fluorescent.

(5) *Quinamine.*—An alkaloid, $C_{19}H_{24}N_2O_2$. Not important.

(6) *Kinic or Quinic Acid.*—$C_7H_{12}O_6$. Large, colorless prisms. It and its salts are soluble in water, and thus Quinine may be given subcutaneously as Quinine Quinate. This acid is found in the Coffee Bean and other plants. It is allied to Benzoic Acid, and appears in the urine as Hippuric Acid.

(7) *Kinovic or Quinovic Acid,* $C_{32}H_{48}O_6$.—A white amorphous substance related to Kinovin.

(8) *Kinovin or Quinovin.*—A glucoside, $C_{30}H_{48}O_8$, which easily decomposes into Glucose and Kinovic Acid.

(9) *Cinchotannic Acid.*—2 to 4 per cent. It is the astringent principle of Cinchona Bark. It differs from Tannic Acid in becoming green with ferric salts. It is easily oxidized to Cinchona Red.

(10) *Cinchona Red.*—The coloring matter of the bark. It is almost insoluble in water.

(11) *A Volatile Oil.*—This exists in minute quantities. Cinchona Bark owes its smell to it.

Remijia Bark yields, in addition, Homoquinine, which is a compound of Quinine and another alkaloid, Cupreine, $C_{19}H_{22}N_2O_2$.

Impurities.—Inferior barks, known by their not yielding the full strength of Quinine and Cinchonine.

The true yellow Cinchona Bark must not be confounded with other Cinchona barks of a similar color, but having the bast fibres in bundles or raised rows, and breaking with a splintery or coarsely fibrous fracture.

Incompatibles.—Alkalies and their carbonates, alkaloidal precipitants (*See* pp. 3 and 250), ammonia, gelatin, lime water, metallic salts.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Fluidextractum Cinchonæ.**—Fluidextract of Cinchona. By maceration and percolation with Alcohol, Glycerin and Water, and evaporation; addition of Alcohol.

Dose, 1 c.c. (15 ♏).

2. Tinctura Cinchonæ.—Tincture of Cinchona. Cinchona, 200; Glycerin, 75. By maceration and percolation with Alcohol and Water to 1000.

Dose, 4 c.c. (1 fl. dr.).

CINCHONA RUBRA.

RED CINCHONA.—The dried bark of *Cinchona succirubra* Pavon (Fam. *Rubiaceæ*), or of its hybrids, yielding, when assayed, not less than 5 per cent. of anhydrous Cinchona alkaloids. *Habitat.*—Ecuador, west of Chimborazo.

CHARACTERS.—In quills or curved pieces, of variable size, the bark 2 to 5 mm. thick; externally gray or grayish-brown, more or less rough from longitudinal rows of warts, or from warty ridges which are sometimes fissured, the transverse fissures rarely numerous or much intersected, and having their sides sloping; inner surface reddish or orange-brown, distinctly striate; fracture short and granular in the outer, shortly and rather coarsely splintery in the inner bark; slightly odorous; taste bitter and astringent; powder reddish-brown.

CONSTITUENTS.—*See* Cinchona.

Dose, 1 gm. (15 gr.).

Preparation.

Tinctura Cinchonæ Composita.—Compound Tincture of Cinchona. Red Cinchona, 100; Bitter Orange Peel, 80; Serpentaria, 20; Glycerin, 75. By maceration and percolation with Alcohol, Glycerin and Water to 1000.

Dose, 4 c.c. (1 fl. dr.).

The name "Huxham's Tincture" is often incorrectly applied to this preparation.

QUININA.

1. QUININE.—$C_{20}H_{24}N_2O_2 + 3H_2O = 375.46$. An alkaloid obtained from the bark of various species of Cinchona. Like other alkaloids, it should be kept in well-stoppered, amber-colored vials.

SOURCE.—By adding to a solution of the Sulphate a sufficient quantity of Ammonia Water to precipitate the Alkaloid.

CHARACTERS.—A white, flaky or micro-crystalline powder, odorless, having a bitter taste, and slightly efflorescent in dry air. *Solubility.*—Quinine free from water is soluble in 1750 parts of water, 0.6 part of Alcohol, 4.5 of Ether, 1.9 of Chloroform, 158 of Glycerin, 120 of Benzene, 3450 of a solution of Potassium Hydroxide (1 in 20), and 1810 of Ammonia Water; in 810 parts of water at 80° C. (176° F.). It is soluble in diluted acids.

IMPURITIES.—Other alkaloids, cinchonine, cinchonidine and morphine;

thalleioquin; ammonium salts; readily carbonizable organic impurities; lime, chalk, magnesia, starch and other white powders; salicin, detected by its giving a blood-red color with sulphuric acid.

IMCOMPATIBLES.—Those common to all alkaloids. (*See* Atropine, p. 220.)

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Quinine is used to prepare Ferri et Quininæ Citras and Ferri et Quininæ Citras Solubilis. *It is contained in* Elixir Ferri, Quininæ et Strychninæ Phosphatum, Glyceritum Ferri, Quininæ et Strychninæ Phosphatum, Syrupus Ferri, Quininæ et Strychninæ Phosphatum, and Syrupus Hypophosphitum Compositum.

Preparation.

Oleatum Quininæ.—Oleate of Quinine. Quinine, 25; Oleic Acid, 75.

2. QUININÆ SULPHAS.—Quinine Sulphate. $(C_{20}H_{24}N_2O_2)_2H_2SO_4 + 7H_2O = 866.15$. The Sulphate $[SO_2(OH)_2 \cdot C_{20}H_{24}N_2O_2 + 7H_2O]$ of the alkaloid Quinine.

SOURCE.—By boiling Cinchona in water acidulated with Hydrochloric Acid and straining. Add Lime to the decoction, and wash the precipitate. Digest in boiling Alcohol, and distil off the Alcohol. Dissolve the residue in Distilled Water and Sulphuric Acid, boil with Animal Charcoal, filter and set aside to crystallize.

CHARACTERS.—White, silky, light, flexible, glistening crystals, or hard prismatic, monoclinic needles, making a very light and easily compressible mass, odorless, and having a persistent, very bitter taste. It effloresces rapidly when it is exposed to dry air, and then becomes lustreless; when exposed to light it acquires a brownish tint. Quinine Sulphate sometimes crystallizes with 8 molecules of water of crystallization (16.18 per cent.).

Solubility.—In 720 parts of water, 86 of Alcohol, 400 of Chloroform, and 36 of Glycerin; very difficultly soluble in Ether; soluble in 45 parts of water at 80° C. (176° F.), and in 9 of Alcohol at 60° C. (140° F.). Diluted acids increase its solubility in water, and it is easily soluble in a mixture of Chloroform, 2 parts, and Absolute Alcohol, 1 part.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

3. QUININÆ BISULPHAS.—Quinine Bisulphate. $C_{20}H_{24}N_2O_2H_2SO_4 + 7H_2O = 544.33$. The acid Sulphate $[H_2SO_4 \cdot C_{20}H_{24}N_2O_2 + 7H_2O]$ of the alkaloid Quinine.

SOURCE.—By suspending Quinine Sulphate in water, adding Sulphuric Acid, filtering and crystallizing.

CHARACTERS.—Colorless, transparent or whitish, orthorhombic crystals, or small needles, odorless, and having a very bitter taste. It effloresces

on exposure to the air and turns yellow on exposure to light. *Solubility.*—In 8.5 parts of water, 18 of Alcohol, 1770 of Ether, 920 of Chloroform, and 18 of Glycerin; in 0.68 part of water at 80° C. (176° F.), and 0.5 part of Alcohol at 60° C. (140° F.).

Dose, 0.250 gm. = 250 milligm. (4 gr.).

4. QUININÆ HYDROBROMIDUM.—Quinine Hydrobromide. $C_{20}H_{24}N_2O_2HBr + H_2O = 420.06$. The hydrobromide [$HBr \cdot C_{20}H_{24}N_2O_2 + H_2O$] of the alkaloid Quinine.

SOURCE.—By suspending Quinine Sulphate in Water, adding Barium Bromide in solution, filtering, evaporating, and crystallizing.

CHARACTERS.—White, light, silky needles; odorless, and having a very bitter taste; effloresces on exposure to the air. *Solubility.*—In 40 parts of water, 0.67 part of Alcohol, 16 parts of Ether, and 8 parts of Glycerin; in 3 parts of water at 80° C. (176° F.); very soluble in Chloroform.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

5. QUININÆ HYDROCHLORIDUM.—Quinine Hydrochloride. $C_{20}H_{24}N_2O_2HCl + 2H_2O = 393.76$. The hydrochloride [$HCl \cdot C_{20}H_{24}N_2O_2 + 2H_2O$] of the alkaloid Quinine.

SOURCE.—By treating the alkaloid Quinine with diluted Hydrochloric Acid, and crystallization.

CHARACTERS.—White, silky, glistening needles; odorless, and having a very bitter taste; effloresces when exposed to warm air. *Solubility.*—In 18 parts of water, 0.6 part of Alcohol, 0.8 part of Chloroform, 240 parts of Ether and 8 of Glycerin; in 0.4 part of water at 80° C. (176° F.).

Dose, 0.250 gm. = 250 milligm. (4 gr.).

6. QUININÆ SALICYLAS.—Quinine Salicylate. $2C_{20}H_{24}N_2O_2 \cdot C_7H_6O_3 + H_2O = 467.77$. The salicylate [$2C_6H_4(OH)COOH \cdot C_{20}H_{24}N_2O_2 + H_2O$] of the alkaloid Quinine.

SOURCE.—It may be obtained by double decomposition between solutions of Quinine Hydrochloride and Ammonium Salicylate or by saturating an alcoholic solution of Quinine with an alcoholic solution of Salicylic Acid.

CHARACTERS.—Colorless needles, permanent in the air, but on keeping, readily assuming a pinkish color. *Solubility.*—In 77 parts of water, 11 of Alcohol, 110 of Ether, 37 of Chloroform, and 16 parts of Glycerin; in 35 parts of water at 80° C. (176° F.), and 11 of Alcohol at 60° C. (140° F.).

Dose, 0.250 gm. = 250 milligm. (4 gr.).

7. CINCHONINÆ SULPHAS. — Cinchonine Sulphate. $(C_{19}H_{22}N_2O)_2H_2SO_4 + 2H_2O = 717.17$. The neutral sulphate [$SO_2(OH)_2 \cdot (C_{19}H_{22}N_2O)_2 + 3H_2O$] of an alkaloid obtained from the bark of several species of Cinchona.

SOURCE.—Obtained from the mother liquors after the crystallization of the Quinine, Quinidine, and Cinchonidine Sulphates by further concentration, precipitating the alkaloids by Caustic Soda, washing with Alcohol till free from other alkaloids, dissolving in Sulphuric Acid, purifying with animal charcoal, and crystallizing.

CHARACTERS.—White, hard, lustrous prismatic crystals; odorless, and having a very bitter taste; permanent in the air. *Solubility.*—In 58 parts of water, 10 of Alcohol, 69 of Chloroform, and 2300 of Ether; in 32 parts of water at 80° C. (176° F.) and 5.2 of Alcohol at 60° C. (140° F.).

Dose, 0.250 gm. = 250 milligm. (4 gr.).

8. CINCHONIDINÆ SULPHAS.—Cinchonidine Sulphate. $(C_{19}H_{22}N_2O)_2H_2SO_4 + 3H_2O = 735.05$. The neutral sulphate $[SO_2(OH)_2 \cdot (C_{19}H_{22}N_2O)_2 + 3H_2O]$ of an alkaloid obtained from the bark of several species of Cinchona.

SOURCE.—Obtained from the mother liquors after the crystallization of Quinine Sulphate by further concentration, purifying by crystallization from Alcohol, and finally from hot water.

CHARACTERS.—White, silky, glistening needles or prisms, odorless, and having a very bitter taste. *Solubility.*—In 63 parts of water and 72 of Alcohol, 900 of Chloroform, and 4400 of Ether; in 21 parts of water at 80° C. (176° F.) and 32 of Alcohol at 60° C. (140° F.). The presence of sulphates of other Cinchona Alkaloids increases its solubility in Ether and Chloroform.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Unofficial Preparations.

1. **Quinine Carbamas.**—Quinine Carbamate. *Synonym.*—Quinine Urea. A compound salt of Quinine and Urea, soluble in equal parts of water. On account of its solubility and its non-irritant properties it is well suited for subcutaneous use, in a 50 per cent. solution.

Dose, .30 to 1.20 gm.; 5 to 20 gr.

2. **Quininæ Tannas.**—Quinine Tannate. Obtained by precipitating 1 part of Quinine Sulphate, dissolved in 30 parts of water acidulated with a few drops of Sulphuric Acid, with a solution of 3 parts of Tannic Acid dissolved in 30 parts of cold water, and then washing and drying the precipitate. It has the advantage of possessing but little taste, but it is a feeble salt, at best containing not more than 32 per cent. of Quinine.

Dose, .06 to 1.20 gm.; 1 to 20 gr.

Warburg's tincture is a medicine which has a very high reputation in India for malaria. It has been called Tinctura Antiperiodica. The

published formula states that it is a proof-spirit tincture, containing Quinine Sulphate, 80; Socatrine Aloes, 100; Opium, 1; Rhubarb, 32; Camphor, 8; with Angelica, Elecampane, Saffron, Fennel, Gentian, Zedoary, Cubeb, Myrrh, and Agaric, as aromatics, with menstruum to 4000. This contains about 9½ gr. (.60 gm.) of Quinine Sulphate to the ounce (30 c.c.) of menstruum. Dose, 4 to 15 c.c.; 1 to 4 fl. dr. It is often prescribed to be made without the Aloes.

Action.

The bark is more of a gastric irritant than quinine, and is also a decided astringent, while on account of its bulk its active principles are more slowly absorbed. Quinine sulphate, which is commonly known simply as quinine, represents very fully the general action of the drug. It is a protoplasm poison, and its solutions have considerable antiseptic and antifermentative power. In the stomach it acts as a vegetable bitter, and in large doses may cause nausea, vomiting and diarrhœa (in exceptional instances, with bloody stools). The preparations of cinchona bark, however, sometimes exercise an astringent effect upon the intestinal mucous membrane, and cause constipation. Quinine, added to blood outside the body, or injected into the circulation, inhibits the movements of the white blood-corpuscles; but in therapeutic doses it probably has no such effect, though it does diminish the number of leucocytes. It causes at first contraction of the arterioles and a quickening of the heart's action, which are followed by dilatation of the vessels and a weakening of the cardiac contractions. Accompanying the acceleration of the pulse there is a rise in blood-pressure, which seems to depend mainly on the vasoconstriction. The pulse-rate in general follows the blood-pressure, but during the fall it does not sink so rapidly and markedly as the pressure. Quinine very frequently causes derangement of the sense of hearing (ringing in the ears, deafness, etc.), and less commonly disturbances of vision, and these effects are believed to be due to vascular changes, rather than to any action on the brain. In moderate doses it slightly stimulates the respiration, but in large doses acts as a depressant. The activity of the cerebrum is stimulated by small doses, while large ones produce a sense of

heaviness and fullness, with depression, confusion, hallucinations and difficulty of speech; giddiness or vertigo, uncertainty of gait, and slowness of the pulse are also sometimes observed. The spinal cord may be at first stimulated, and afterwards depressed. Quinine appears to have the effect of stimulating uterine contractions when labor has already commenced, and also to be capable of increasing the menstrual flow. It sometimes, but not constantly, causes an increase in the urinary secretion, and even in small doses it diminishes the excretion of nitrogen. Quinine is eliminated mainly by the kidneys. In febrile conditions it has a marked antipyretic effect. *Cinchonism* is the name given to the train of symptoms (the most characteristic of which are a sense of fullness in the head, tinnitus aurium, and slight deafness) to which large doses are liable to give rise; cutaneous eruptions are also occasionally caused. The other alkaloids resemble quinine very closely in their effects, but are weaker in their action. Quinidine is most like quinine, while cinchonine and cinchonidine have a convulsant influence.

Uses.

Quinine is employed locally for unhealthy sores and infected wounds, diphtheria, otorrhœa, whooping-cough, hay-fever, gonorrhœa, chancroids and chronic cystitis. The preparations of cinchona are given in digestive troubles, especially when these are associated with a debilitated state of the system. Quinine is one of the most commonly used of all tonics. Except in the case of malarial fever, it is now comparatively seldom employed as an antipyretic. One of the most positive effects in the whole range of medicine is that of quinine, and to a less pronounced degree the other alkaloids of cinchona, in arresting the paroxysms of malarial fever; it is now known that this result is due to the directly poisonous action of the drug upon the *plasmodium malariæ*, which infests the blood and is the specific cause of the disease. It is both curative and prophylactic; so that its regular administration in very moderate quantities will absolutely or to a large degree protect persons living in malarious regions from ague. Quinine

is used in malarial neuralgia and also in neuraglias not of malarial origin. Among other affections in which it is employed internally also may be mentioned whooping-cough, influenza, the night-sweats of phthisis, the adynamic form of delirium tremens, and various conditions associated with cerebral anæmia.

SALICINUM.

SALICIN. $C_{13}H_{18}O_7 = 283.99$. *Synonym.*—Willow. A glucoside obtained from several species of *Salix* and *Populus* (Fam. *Salicaceæ*). *Habitat.*—Europe, naturalized in North America; cultivated.

SOURCE.—(1) Make a strong decoction of willow bark. (2) Remove the tannic acid by warming and agitating the decoction with Lead Oxide. (3) Evaporate the solution. Salicin crystallizes out, and is purified by repeated solution, and crystallization.

CHARACTERS.—Colorless, silky, shining crystalline needles, rhombic prisms, or a white crystalline powder; odorless, and having a very bitter taste. *Solubility.*—In 21 parts of water and 71 of Alcohol at 25° C. (77° F.); in 3.3 parts of water and 22 of Alcohol at 60° C. (140° F.); insoluble in Ether or Chloroform.

IMPURITY.—Alkaloids.

Dose, 1 gm. (15 gr.).

ACIDUM SALICYLICUM.

SALICYLIC ACID.—$HC_7H_5O_3 = 137.01$. A monobasic organic acid [$C_6H_4(OH)COOH$ 1 : 2], existing naturally, in combination, in various plants (*see* Oleum Gaultheriæ and Oleum Betulæ), but generally prepared synthetically from Phenol.

SOURCE.—Made by combining Sodium Carbolate with Carbon Dioxide Gas. Thus, dry Carbon Dioxide is passed through Sodium Carbolate heated to 428° F.; 220° C. $2NaC_6H_5O + CO_2 = Na_2C_7H_4O_3$ (Sodium Salicylate), $+ C_6H_6O$ (Phenol). This is treated with Hydrochloric Acid. $Na_2C_7H_4O_3 + 2HCl = 2NaCl + HC_7H_5O_3$ (Salicylic Acid).

CHARACTERS.—Light, fine, white, prismatic needles, or a bulky, white, crystalline powder; odorless, or having a slight gaultheria-like odor, with a sweetish, afterwards acrid taste, and permanent in the air. *Solubility.*—In 308 parts of water and 14 of boiling water; in 2 parts of Alcohol; very soluble in boiling Alcohol; also soluble in Ether, Absolute Alcohol and Chloroform. *Resembling Artificial Salicylic Acid.*—Strychnine, but the crystals of Strychnine are larger, colorless, non-irritating, less soluble, and the solution is very bitter.

IMPURITIES.—Orthocreosotic, metacreosotic, and paracreosotic acids, only in artificial salicylic acid. In the best specimens they are absent.

Other impurities: iron, phenol, hydrochloric acid, coloring matter, readily carbonizable organic impurities.

INCOMPATIBLES.—Spirit of nitrous ether, iron salts, lead acetate, potassium iodide, quinine salts, exalgine, urethane.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

AMMONII SALICYLAS. — Ammonium Salicylate. $NH_4C_7H_5O_3 = 153.94$. It should contain not less than 98 per cent. of pure Ammonium Salicylate, $C_6H_4(OH)COONH_4$. Like other Salicylates, it should be kept in well-stoppered bottles, protected from heat and light.

SOURCE.—Obtained by neutralizing Salicylic Acid with Ammonium Carbonate, filtering, evaporating and allowing to crystallize.

CHARACTERS.—Colorless, lustrous, monoclinic prisms, or plates, or a white, crystalline powder; odorless, and having at first a slightly saline, bitter taste, with a sweetish after-taste *Solubility.*—In 0.9 part of water and 2.3 parts of Alcohol; freely in boiling water and in 1 part of boiling Alcohol.

IMPURITIES.—Heavy metals.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

BISMUTHI SUBSALICYLAS, see p. 151.

LITHII SALICYLAS.—Lithium Salicylate. $LiC_7H_5O_3 = 142.99$. It should contain not less than 98 per cent. of pure Lithium Salicylate, $C_6H_4(OH)COOLi$.

SOURCE.—Obtained by heating Salicylic Acid, Lithium Carbonate, and Water, until the effervescence ceases, filtering and evaporating. $Li_2CO_3 + 2HC_7H_5O_3 = 2LiC_7H_5O_3 + H_2O + CO_2$.

CHARACTERS.—A white, or grayish-white powder, odorless, and having a sweetish taste; deliquescent in a moist atmosphere. *Solubility.*—Very soluble in water and in Alcohol.

IMPURITIES.—Lithium carbonate, other alkalies, iron, aluminum, heavy metals, organic coloring matters.

Dose, 1 gm. (15 gr.).

SODII SALICYLAS.—Sodium Salicylate. $NaC_7H_5O_3 = 158.89$. It should contain not less than 99.5 per cent. of pure Sodium Salicylate, $C_6H_4(OH)COONa$.

SOURCE.—Obtained by acting on Sodium Carbonate with Salicylic Acid. $2HC_7H_5O_3 + Na_2CO_3 = 2NaC_7H_5O_3 + H_2O + CO_2$. The solution may be strained through muslin and heated to expel the Carbon Dioxide.

CHARACTERS.—White, micro-crystalline powder or scales, or an amorphous, colorless powder, or having not more than a faint pink tinge; odorless and having a sweetish, saline taste. *Solubility.*—In 0.8 part of water,

and in 5.5 parts of Alcohol; very soluble in boiling water or Alcohol; also soluble in Glycerin.

IMPURITIES.—Sulphites, heavy metals.

INCOMPATIBLES.—Hydrobromic acid, for sodium bromide is formed and salicylic acid is precipitated; spirit of nitrous ether, ferric salts, mineral acids, quinine salts in solution, lime water, lead acetate, silver nitrate (in solution), sodium phosphate (in powder).

Dose, 1 gm. (15 gr.).

STRONTII SALICYLAS.—Strontium Salicylate. $Sr(C_7H_5O_3)_2 + 2H_2O = 394.72$. It should contain not less than 98.5 per cent. of pure Strontium Salicylate, $(C_6H_4 \cdot OH \cdot COO)_2Sr + 2H_2O$.

SOURCE.—5.34 parts of pure Strontium Carbonate, free from Iron, are stirred into 100 parts of hot water to which 10 parts of Salicylic Acid have been added. Heat is applied until effervescence ceases, when the product is filtered and evaporated to crystallization.

CHARACTERS.—A white, crystalline powder; odorless, and having a sweetish, saline taste. *Solubility.*—In 18 parts of water and 66 of Alcohol; in 3.5 parts of boiling water and 10.5 of boiling Alcohol.

IMPURITIES.—Barium, heavy metals.

Dose, 1 gm. (15 gr.).

ACTION.

Antiseptic; irritant; strongly cholagogue; antipyretic; diaphoretic; diuretic (markedly increasing the excretion of uric acid). In exceptional instances skin eruptions are caused, and in some individuals a train of symptoms analogous to those of cinchonism, and designated as *salicylism*, results from the use of salicylic preparations.

USES.

Externally, as antiseptic and stimulating applications and for the checking of abnormal perspiration; also in parasitic and other skin diseases. Internally, rheumatic fever (in which these drugs seem to act as specifics); gout; migraine; sciatica; diabetes; cholelithiasis. Salicin, which produces no gastric irritation, is useful in atonic dyspepsia, as a stomachic, and also in gastro-intestinal catarrh and the chronic diarrhœa of children.

PHENYLIS SALICYLAS.

PHENYL SALICYLATE. $C_{13}H_{10}O_3 = 212.47$. *Synonym.*—Salol. The Salicylic Ester $[C_6H_4(OH)COOC_6H_3\ 1:2]$ of Phenyl.

SOURCE.—By heating Salicylic Acid with Phenol in the presence of Phosphorus Pentachloride; this action dehydrates and withdraws the elements of water, and unites the Phenyl group with the Salicylic Acid radical.

CHARACTERS.—A white, crystalline powder, having a faint, aromatic odor, and a slight, but characteristic, taste. *Solubility.*—In 2333 parts of water and 5 of Alcohol; very soluble in hot Alcohol and in Ether, Chloroform, and fixed and volatile oils.

IMPURITIES.—Sulphates, chlorides, free acids, uncombined phenol and salicylic acid.

INCOMPATIBLES.—Camphor, phenol, hydrated chloral, naphthalene, thymol, ferric chloride, exalgine.

Dose, 0.500 gm. =500 milligm. (7½ gr.).

ACTION.

Antiseptic; germicidal; antipyretic; its too free use may give rise to the symptoms of phenol poisoning.

USES.

Externally, for wounds, burns, ulcers, etc., and for erysipelas, impetigo and other cutaneous affections; internally as an intestinal antiseptic in acute diarrhœa, dysentery, typhoid fever, cholera and other diseases; epidemic influenza; neuralgias and the bilious form of sick headache.

METHYLIS SALICYLAS.

METHYL SALICYLATE.—$CH_3C_7H_5O_3 = 150.92$. *Synonym.*—Artificial (or Synthetic) Oil of Wintergreen. An ester [$C_6H_4(OH)COOCH_3$-1 : 2], produced synthetically. It is the principal constituent of Oil of Gaultheria and Oil of Betula; and for flavoring purposes Oil of Gaultheria, Oil of Betula, and Methyl Salicylate may be regarded as identical products.

SOURCE.—Usually obtained by heating Salicylic Acid and Methyl Alcohol together in the presence of Sulphuric Acid, the latter serving only to abstract the water as fast as eliminated. $C_6H_4OHCOOH + CH_3OH = C_6H_4$-$OHCOOH_3 + H_2O$. The newly formed salicylate floats on the surface of the liquid, and is subsequently purified by distillation.

CHARACTERS.—A colorless liquid, having a characteristic, strongly aromatic, wintergreen odor and a sweetish, warm and aromatic taste. Sp. gr., 1.180 to 1.185. Boiling point, 219° to 221° C. (426.2° to 429.8° F.). It is optically inactive. *Solubility.*—In all proportions in Alcohol, Glacial Acetic Acid, or Carbon Disulphide; sparingly in water.

IMPURITIES.—Methyl benzoate, alcohol, chloroform, other volatile oils, petroleum.

Dose, 1 c.c. (15 ♏).

Methyl Salicylate is contained in Cataplasma Kaolini.

ACTION.

The same as that of salicylic acid.

USES.

The same as those of salicylic acid.

OLEUM GAULTHERIÆ.

OIL OF GAULTHERIA. *Synonym.*—Oil of Wintergreen. A volatile oil distilled from the leaves of *Gaultheria procumbens* Linné (Fam. *Ericaceæ*), rectified, if necessary, by steam distillation. It should be preserved like other volatile oils. *Habitat.*—North America, west to Minnesota, and south to Georgia.

CHARACTERS.—A colorless or almost colorless liquid, having a characteristic, strongly aromatic odor and a sweetish, warm and aromatic taste. Sp. gr., 1.172 to 1.180. It deviates polarized light slightly to the left. In other respects it has the same properties and conforms to the same reactions and tests as Methyl Salicylate (*see* Methylis Salicylas; also Oleum Betulæ).

Dose, 1 c.c. (15 ♏).

Oil of Gaultheria is contained in Cataplasma Kaolini, Emulsum Olei Morrhue, Emulsum Olei Morrhuæ cum Hypophosphitus, and Syrupus Sarsaparillæ Compositus.

Preparation.

Spiritus Gaultheriæ.—Spirit of Gaultheria. Oil of Gaultheria, 50; Alcohol, 950.

Dose, 2 c.c. (30 ♏).

OLEUM BETULÆ.

OIL OF BETULA. *Synonym.*—Oil of Sweet Birch. A volatile oil obtained by distillation from the bark of the Sweet Birch, *Betula lenta* Linné (Fam. *Betulaceæ*). *Habitat.*—Northern United States.

CHARACTERS.—It is optically inactive, but otherwise has essentially the same properties and conforms to the same reactions and tests as Oleum Gaultheriæ. It is identical with Methyl Salicylate ($CH_3C_7H_5O_3 = 150.92$), and nearly identical with Oil of Gaultheria.

Dose, 1 c.c. (15 ♏).

ACTION.

The same as that of salicylic acid.

USES.

The same as salicylic acid.

CREOSOTE nd phenol derivatives, chiefly Guaiacol and

SOURCE.—(of wood-tar, preferably of that derived from ané or *Fagus ferruginea* Aiton (Fam. *Fagac*

CHARACTERS lowish (not pinkish), highly refractive, oily smoky odor, and a burning, caustic taste. It shou on exposure to light. Sp. gr., not below 1.078. *Solubility.*—In about 140 parts of water, but without forming a perfectly clear solution; freely in Absolute Alcohol, Ether, Chloroform, Acetic Acid, and fixed and volatile oils.

IMPURITIES.—Phenol (which coagulates albumin and collodion; Creosote does not); so-called "coal-tar creosote," neutral oils, cœrulignol and other high-boiling constituents of wood-tar.

INCOMPATIBLES.—Silver, gold, cupric and ferric salts, acacia, albumin, oxidizers. Explodes when mixed with silver oxide.

Dose, 0.2 c.c. (3 ♏).

Preparation.

Aqua Creosoti. — Creosote Water. Creosote, 10; distilled water, 990.

Dose, 8 c.c. (2 fl. dr.).

Unofficial Preparation.

Creosoti Carbonas. — Creosote Carbonate. *Synonym.* — Creosotal.

SOURCE.—Obtained by the action of Carbon Oxychloride upon the phenol-sodium compounds of Creosote.

CHARACTERS.—A thick, oily liquid, analogous to Guaiacol Carbonate; amber-colored, odorless, with a bitter taste suggestive of Creosote; sp. gr., 1.166; contains 90 per cent. Creosote. *Solubility.*—Insoluble in water or Glycerin; soluble in Alcohol, Chloroform, Ether, Benzene, and fatty oils (5 parts cod-liver oil).

Dose, 1 to 4 c.c.; 15 to 60 ♏.

Action.

Practically the same as carbolic acid.

Uses.

Tuberculosis; pneumonia; bronchitis; vomiting; diarrhœa; dysentery; typhoid fever; diabetes; tape-worm. Locally, tooth-ache; sore throat; burns; chilblains; otorrhœa; ozæna; pruritus; condylomata; gleet; leucorrhœa; uterine hæmorrhage; puerperal metritis; as a preservative of animal tissue. The most important use is as a pulmonary antiseptic, administered by the mouth, hypodermatically, or by inhalation.

GUAIACOL.

GUAIACOL. $C_7H_8O_2 = 123.13$. *Synonym.* — Methyl Pyrocatechin. One of the chief constituents [$C_6H_4(OH)(OCH_3)$ 1:2] of Creosote. It should be preserved in amber-colored bottles, protected from light.

Source.—Obtained by collecting and purifying the fraction of Creosote boiling between 200° and 205° C. (392° and 401° F.); or prepared synthetically from either Catechol by methylating, or from Orthoanisidin by diazotizing and boiling.

Characters.—A colorless, crystalline solid, melting at 28.5° C. (83.3° F.), or a colorless refractive liquid, boiling at 205° C. (401° F.), having an agreeable aromatic odor. Sp. gr. of liquid, 1.110 to 1.114. *Solubility.*—In 53 parts of water and in all proportions in Alcohol and Ether; soluble in Acetic Acid and in 1 part of Glycerin.

Impurities.—Oily hydrocarbons.

Dose, 0.5 c.c. (8 ♏).

GUAIACOLIS CARBONAS.

GUAIACOL CARBONATE. $(C_7H_7O)_2CO_3 = 272.05$. A Guaiacol derivative [$C_8H_4(OCH_3)O)_2 \cdot CO$], obtained by the action of Carbonyl Chloride upon Sodium-guaiacolate.

Source.—By passing Phosgene gas (Carbonyl Chloride, $COCl_2$) into Guaiacol, previously dissolved in a Sodium Hydroxide solution. The Carbonate is obtained by crystallization.

Characters.—A white, neutral, crystalline powder, almost odorless and tasteless. *Solubility.*—Insoluble in water; soluble in 48 parts of Alcohol, 1.5 of Chloroform, and 13 of Ether; readily in hot Alcohol and Benzene; slightly in Glycerin and fatty oils.

Impurity.—Free guaiacol.

Dose, 1 gm. (15 gr.).

ACTION.

Similar to that of creosote, though guaiacol is less likely to irritate the intestinal canal and kidneys.

USES.

Pulmonary tuberculosis; typhoid fever; diabetes mellitus. Guaiacol, especia[illegible] been extensively used in phthisis, under t[illegible] destructive effect upon the bacilli of the di[illegible] absolutely certain evidence that such is the [illegible]

ion.

Salophenum.—[illegible]$)CO_2C_6H_4NHCOCH_3$ = 270.40. *Synony*[illegible]nol Salicylate.

SOURCE.—Fro[illegible]cylate by a complicated process, and purifying by crystallization from Alcohol.

CHARACTERS.—**Minute white scales, free from odor or taste.** It contains 50.9 per cent. of Salicylic Acid. *Solubility.*—Almost insoluble in water; freely soluble in Alkalies, Alcohol and Ether.

Dose, .30 to 1.00 gm.; 5 to 15 gr.

ACTION.

It is regarded as possessing the medicinal, without the toxic, qualities of phenyl salicylate.

USES.

As a substitute for salicylic acid in acute rheumatism and as an intestinal antiseptic.

GROUP V.—The Purgatives.

CLASS I.—LAXATIVES.

Prune, Fig, Tamarind, Cassia Fistula, Manna, Phytolacca, Eupatorium.

PRUNUM.

PRUNE.—The partly dried fruit of *Prunus domestica* Linné (Fam. *Rosaceæ*). *Habitat.*—Western Asia; cultivated in many varieties.

CHARACTERS.—Oblong, ellipsoidal, more or less compressed, 3 to 4 cm. long; externally brownish-black, shriveled; the sarcocarp sweet and acidu-

lous; putamen hard, smooth, or irregularly ridged; the seed, shaped like that of the almond, but smaller, and of a bitter-almond taste.

COMPOSITION.—The chief constituents are—(1) Sugar, 12 to 15 per cent.; (2) Malic Acid, and (3) A purgative principle.

Prune is contained in Confectio Sennæ.

ACTION.

Demulcent; nutritive; laxative.

USES.

In cases of slight constipation.

FICUS.

FIG.—The partially dried fruit of *Ficus carica* Linné (Fam. *Moraceæ*). *Habitat.*—Western Asia; cultivated in subtropical countries.

CHARACTERS.—Compressed, of irregular shape, fleshy, brownish or yellowish, covered with an efflorescence of sugar; apex with a small scaly orific; base with a scar or short stalk; internally hollow, with numerous small, brownish-yellow, glossy and hard akenes; odor distinct, fruity; taste sweet, pleasant.

COMPOSITION.—The chief constituents are—(1) Sugar, 62 per cent.; (2) Gum; (3) Fat and Salts.

Fig is contained in Confectio Sennæ.

ACTION.

Nutritive; mildly purgative.

USES.

As a laxative; fig poultices are used to neutralize the fetor of cancerous and other ulcers.

TAMARINDUS.

TAMARIND.—The preserved pulp of the fruit of *Tamarindus indica* Linné (Fam. *Leguminosæ*). *Habitat.*—India and tropical Africa; naturalized in the West Indies.

CHARACTERS.—A pulpy mass of a light reddish-brown color, darkening with age, containing some branching fibres and numerous reddish-brown, smooth, oblong or quadrangular, compressed seeds, each enclosed in a tough membrane; odor distinct; taste sweet and agreeably acid.

IMPURITY.—Copper.

COMPOSITION.—(1) Tartaric, Citric, Malic and Acetic Acids; (2) Sugar; (3) Pectin; (4) Tannic acid and (5) Potassium compounds.

Dose, 16 gm. (240 gr.).

Tamarind is contained in Confectio Sennæ.

ACTION.

Nutritive; refrigerant; laxative.

USES.

As a laxative; in the form of a drink in fevers.

CASSIA FISTULA.

CASSIA FISTULA—[illegible] Cassia. The dried fruit of *Cassia Fistula* [illegible]*osæ*). *Habitat.*—East India; naturalized in tropi[illegible]

CHARACTERS.—C[illegible]ng, about 20 mm. in diameter, chestnut-brown in co[illegible]gitudinal groove, and on the other a smooth line o[illegible]g the two sutures; indehiscent, the cavity divided tra[illegible]compartments, each containing a reddish-brown, glo[illegible]nbedded in a blackish-brown, sweet pulp with an odor resembling that of prunes and a mawkish sweet taste.

COMPOSITION.—**The chief constituents are**—(1) **A purgative principle,** closely allied to *Cathartic Acid.* (*See* Senna, p. 290) (2) ***Sennapicrin,*** a Glucoside, $C_{34}H_{58}O_{17}$. (3) Sugar, 60 per cent. (4) Pectin. (5) Calcium Oxalate.

Dose, 4 gm. (60 gr.).

Cassia Fistula is contained in Confectio Sennæ.

ACTION.

Laxative; in quantities sufficient to purge it causes nausea, flatulence and griping.

USES.

Rarely prescribed except in the form of Confection of Senna.

MANNA.

MANNA.—The concrete saccharine exudation of *Fraxinus Ornus* Linné (Fam. *Oleaceæ*). *Habitat.*—Basin of the Mediterranean.

CHARACTERS.—In irregular, more or less elongated, flattish, 3-sided pieces; externally yellowish-white; friable, somewhat waxy; internally whitish, porous and crystalline; odor suggestive of maple sugar; taste sweet, slightly bitter and faintly acrid. On heating 5 parts of Manna with 100 parts of Alcohol to boiling, and filtering, the filtrate should rapidly deposit crystals of Mannite.

COMPOSITION.—The chief constituents are—(1) Mannite, $C_6H_8(OH)_6$,

90 per cent. (2) Glucose. (3) Fraxin, $C_{32}H_{36}O_{20}$. (4) Mucilage. (5) Resin.

Dose, 16 gm. (240 gr.).

Manna is contained in Infusum Sennæ Compositum.

ACTION.

Aperient when taken in considerable quantities.

USES.

As a mild laxative for children.

PHYTOLACCA.

PHYTOLACCA.—Phytolacca. *Synonym.*—Poke Root. The dried root of *Phytolacca decandra* Linné (Fam. *Phytolaccaceæ*), collected in autumn.

CHARACTERS.—Cylindrical, somewhat tapering, sparingly branched, 3 to 7 cm. thick, mostly in transverse or longitudinal slices; externally yellowish brown, finely longitudinally or spirally wrinkled and thickly annulate with lighter colored, low ridges; fracture fibrous, characterized by alternating layers of fibro-vascular tissue and parenchyma, the layers of the latter being much retracted; odor slight; taste sweetish, afterwards highly acrid.

CONSTITUENTS.—(1) Resin. (2) Probably a Glucoside. (3) A volatile acid.

Dose (emetic), **1 gm. (15 gr.)**; (alterative) **0.125 gm. = 125 milligm. (2 gr.).**

Preparation.

Fluidextractum Phytolaccæ.—Fluidextract of Phytolacca. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, (emetic), **1 c.c. (15 ♏)**; (alterative) **0.1 c.c. (1½ ♏).**

ACTION.

Emetocathartic; in large doses somewhat narcotic.

USES.

As a laxative; to reduce adipose tissue.

EUPATORIUM.

EUPATORIUM. *Synonyms.*—Thoroughwort. Boneset. The dried leaves and flowering tops of *Eupatorium perfoliatum* Linné (Fam. *Compositæ*). *Habitat.*—North America, west to Dakota; in low grounds.

CHARACTERS.—Usually occurring in fragments; leaves opposite, the pair united at the base, from 8 to 20 cm. long and 1.5 to 5 cm. broad, tapering

regularly from near the base to an acute apex, crenate-serrate, rugosely veined, rough and bright green above, yellowish-gray-green, tomentose and resinous-dotted beneath; flower-heads small, numerous, corymbed, with a campanulate involucre of lance-linear imbricated scales, and with from ten to fifteen tubular yellowish-white florets, having a bristly pappus in a single row; odor faintly aromatic; taste strongly bitter.

COMPOSITION.—Its principal constituents are—(1) *Eupatorin*, a bitter glucoside. (2) Volatile Oil. (3) Resin.

Dose, 2 gm. (30 gr.)

Preparation.

Fluidextractum Eupatorii.—Fluidextract of Eupatorium. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Tonic; diaphoretic (in infusion); mildly laxative.

USES.

It is a domestic remedy for the commencement of a catarrh, influenza, or muscular rheumatism.

CLASS II.—SIMPLE PURGATIVES.

Castor Oil, Rhubarb, Senna, Frangula, Cascara Sagrada, Aloes.

OLEUM RICINI.

CASTOR OIL.—A fixed oil expressed from the seed of *Ricinus communis* Linné (Fam. *Euphorbiaceæ*). *Habitat.*—India; cultivated.

CHARACTERS.—A pale yellowish or almost colorless, transparent, viscid liquid, having a faint, mild odor, and a bland, afterwards slightly acrid and generally offensive taste. Sp. gr., 0.945 to 0.965. *Solubility.*—In an equal volume of Alcohol, and, in all proportions, in Absolute Alcohol or Glacial Acetic Acid; also soluble in 3 times its volume of 92.5 per cent. of Alcohol (absence of more than about 5 per cent. of *most other fixed oils*).

COMPOSITION.—The chief constituents are—(1) *Ricinolein*, $C_3H_5(C_{18}H_{34}O_3)_3$, which is the Ricinoleic Acid ($C_{18}H_{34}O_3$), Glyceride. This constitutes the chief bulk. (2) Other fixed oils, as palmitin, stearin, etc. (3) Possibly an alkaloid, *Ricinine*, not purgative. (4) According to some authorities an active principle which has not yet been isolated.

IMPURITIES.—Foreign oils.

Dose, 16 c.c. (4 fl. dr.).

Castor oil is contained in Collodium Flexile.

Castor oil seeds are not official, but it is important to recognize them. They are 17 mm. long and 8 mm. wide, ovoid, flattened. The seed is prolonged into a sharp beak. Epidermis shiny gray, marked by brownish bands and spots. Kernel white. They contain 50 per cent. of the oil, and an acrid substance, *Ricin*, a toxalbumin, which makes them poisonous. Three Castor oil seeds have been known to kill an adult man. Quite likely the seeds are not poisonous when matured.

Action.

Externally it is emollient; internally a simple purgative; causing soft, but not liquid, stools, usually without griping.

Uses.

On account of the mildness of its action, it is very useful in cases where it is desired simply to evacuate the alimentary canal, and when inflamed hæmorrhoids, fissures of the anus, or surgical operations on the pelvic viscera require the use of a certain but unirritating laxative, castor oil should be selected. It is advantageous in commencing the treatment of the diarrhœa of children which is induced by undigested food or irritating secretions, and also in the form of an emulsion (to which opiates may be added, if necessary) in dysentery and entero-colitis in young subjects. It is not suited for cases of chronic constipation. With balsam of Peru it makes an excellent surgical dressing, and it is also used as a basis for ointments for the treatment of alopecia.

RHEUM.

RHUBARB.—The dried rhizome of *Rheum officinale* Baillon, *Rheum palmatum* Linné, and the var. *tanguticum* Maximowicz (Fam. *Polygonaceæ*), or probably other species of *Rheum*, grown in China and Thibet, and deprived of most of the bark and carefully dried. *Habitat.*—Western and Central China, and Thibet.

Characters.—Subcylindrical, barrel-shaped, conical, plano-convex or irregularly formed pieces, frequently with a large perforation; hard and moderately heavy; 5 to 15 cm. long, 4 to 8 cm. in diameter; externally mottled with alternating striæ of light brown parenchyma cells and dark brown medullary rays, occasionally with reddish-brown cork patches and small, radiate scars of fibrovascular tissue, smooth and sometimes covered with a bright brownish-yellow powder; fracture somewhat granular, presenting

a peculiar marbled appearance; odor characteristic; taste bitter, astringent; gritty when chewed. Powder bright orange-yellow, becoming red with alkalies, containing rosette-shaped crystals of calcium oxalate which are from 0.050 to 0.100 mm. in diameter, and spherical starch grains from 0.005 to 0.020 mm. in diameter, either single or 2- to 4-compound.

COMPOSITION.—The chief constituents are—(1) *Chrysophan*, $C_{27}H_{30}O_{14}$, which yields Chrysophanic Acid, $C_{15}H_{10}O_4$, about 3 per cent. *Synonyms.*—Rhein. Chrysarobin (*see* Chrysarobinum). It is not known whether, in the living plant, Chrysophanic Acid, for when kept the Chrysopha- ysophanic Acid. The purga- tive properties are a hich also gives the yellow color. (2) *Erythroretin.* in. (5) *Aporetin.* (6) *Rheo-tannic Acid*, C_1 ingency of Rhubarb is due. (7) Lime Oxalate, grittiness is due.

IMPURITIES.—E taste, smell, and excess of starch. Turmeric, y Boric Acid.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Extractum Rhei.**—Extract of Rhubarb. By evaporating the Fluidextract to a pilular consistence.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

2. **Fluidextractum Rhei.**—Fluidextract of Rhubarb. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 1 c.c. (15 ♏).

3. **Mistura Rhei et Sodæ.**—Mixture of Rhubarb and Soda. Sodium Bicarbonate, 35; Fluidextract of Rhubarb, 15; Fluidextract of Ipecac, 3; Spirit of Peppermint, 35; Glycerin, 350; Water to 1000. By solution.

Dose, 4 c.c. (1 fl. dr.).

4. **Pilulæ Rhei Compositæ.**—Compound Pills of Rhubarb. Rhubarb, 13; Purified Aloes, 10; Myrrh, 6; Oil of Peppermint, 0.5, to make 100 pills. Each pill contains .13 gm., 2 gr., of Rhubarb.

Dose, 2 pills.

5. **Pulvis Rhei Compositus.**—Compound Powder of Rhubarb. *Synonym.*—Gregory's powder. Rhubarb, 25; Magnesium Oxide, 65; Ginger, 10.

Dose, 2 gm. (30 gr.).

6. Syrupus Rhei.—Syrup of Rhubarb. Fluidextract of Rhubarb, 100; Potassium Carbonate, 10; Spirit of Cinnamon, 4; Water, 50; Syrup to 1000. By solution.

Dose, 8 c.c. (2 fl. dr.).

7. Syrupus Rhei Aromaticus.—Aromatic Syrup of Rhubarb. Aromatic Tincture of Rhubarb, 150; Potassium Carbonate, 1; Syrup, 850. By mixture.

Dose, 8 c.c. (2 fl. dr.).

8. Tinctura Rhei.—Tincture of Rhubarb. Rhubarb, 200; Cardamom, 40; Glycerin, 100; Alcohol and Water to 1000; by maceration and percolation.

Dose, 4 c.c. (1 fl. dr.).

9. Tinctura Rhei Aromatica.—Aromatic Tincture of Rhubarb. Rhubarb, 200; Saigon Cinnamon, 40; Cloves, 40; Nutmeg, 20; Glycerin, 100; Alcohol and water, to 1000. By maceration and percolation.

Dose, 2 c.c. (30 ♏).

Action.

Stomachic; purgative; slightly cholagogue; diuretic; astringent.

Uses.

Indigestion; constipation; diarrhœa. Notwithstanding its astringent property, rhubarb is largely used as an habitual laxative, as it improves the appetite and digestion. On account of the griping which it is apt to occasion, it should rarely be prescribed alone.

SENNA.

SENNA.—The dried leaflets of *Cassia acutifolia* Delile (Alexandria Senna), or of *Cassia angustifolia* Vahl (India Senna); (Fam. *Leguminosæ*).

Characters.—*Alexandria Senna.*—Leaflets about 25 mm. long and 10 mm. broad, having extremely short, stout petioles; inequilaterally lanceolate, or lance-oval, acutely cuspidate, entire, subcoriaceous, brittle, pale green or grayish-green, sparsely and obscurely hairy, especially beneath, the hairs appressed, 1-celled and thick-walled; odor characteristic; taste somewhat mucilaginous and bitterish. *Habitat.*—Eastern and Central Africa.

India Senna. Synonym.—Tinnivelly Senna. Leaflets 25 to 50 mm. long, 10 to 15 mm. broad, inequilaterally lanceolate, thin, more abruptly pointed than those of Alexandria Senna, yellowish-green, and smooth above,

paler beneath; in odor and taste closely resembling Alexandria Senna. *Habitat.*—Eastern Africa to India; cultivated.

Senna should be free from stalks, and from Argel leaves, which are sometimes present in Alexandria Senna and which are equilateral, 1-veined, thick, wrinkled, glaucous, and possess 3-celled hairs.

Resembling Senna.—Argel leaves (the leaves of *Solenostemma Argel*) Hayne (Fam. *Asclepiadeæ*), which are frequently present; these leaves are similar to those of Uva Ursi and Buchu.

Composition of Both Kinds.—The chief constituents are—(1) *Cathartic Acid*, $C_{180}H_{192}N_{82}SO_2$, an amorphous sulphurated Glucoside. It exists as salts of earthy bases, such as Calcium and Magnesium, which are soluble in water. Cathartic Acid is capable of decomposition into Glucose and *Cathartogenic Acid*. It is the chief purgative principle in Senna and other purgatives. (2) *Sennacrol* and *Sennapicrin*, $C_{34}H_{58}O_{17}$, glucosides, which do not, in most preparations, contribute to their action, as they are insoluble in water. (3) *Chrysophanic Acid* in small amounts as a coloring matter (*see* Rhubarb and Chrysarobinum). (4) *Cathartomannit*, $C_{21}H_{44}O_{19}$, a peculiar unfermentable sugar.

Dose, 4 gm. (60 gr.).

Preparations.

1. **Confectio Sennæ.**—Confection of Senna. Senna, 100; Cassia Fistula, 160; Tamarind, 100; Prune, 70; Fig, 120; Sugar, 555; Oil of Coriander, 5; Water to make 1000. By sifting, digestion and evaporation.

Dose, 4 gm. (60 gr.).

2. **Fluidextractum Sennæ.**—Fluidextract of Senna. By maceration, percolation with Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

Fluidextract of Senna is used to prepare Syrupus Sarsaparillæ Compositus.

3. **Infusum Sennæ Compositum.**—Compound Infusion of Senna. *Synonym.*—Black Draught. Senna, 60; Manna, 120; Magnesium Sulphate, 120; Fennel, 20; Boiling Water, 800; Cold Water to 1000.

Dose, 120 c.c. (4 fl. oz.).

4. **Pulvis Glycyrrhizæ Compositus.**—Compound Powder of Glycyrrhiza. *Synonym.*—Compound Licorice Powder. Senna, 180; Glycyrrhiza, 236; Oil of Fennel, 4; Washed Sulphur, 80; Sugar, 500.

Dose, 4 gm. (60 gr.).

5. Syrupus Sennæ.—Syrup of Senna. Fluidextract of Senna, 250; Oil of Coriander, 5; Syrup to 1000.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

Purgative; more liable to induce griping and nausea than rhubarb. Its cathartic acid is believed to stimulate the muscular coat of the intestine, especially the colon.

USES.

It is a safe and reliable remedy in simple constipation, and is usually combined with other drugs.

FRANGULA.

FRANGULA. *Synonym.*—Buckthorn. The dried bark of *Rhamnus Frangula* Linné (Fam. *Rhamnaceæ*), collected at least one year before being used. *Habitat.*—Europe and Northern Asia.

CHARACTERS.—In quills of variable length, frequently flattened or crushed; bark .03 to 1 mm. thick, externally grayish-brown to purplish-black, with numerous lenticels and occasional patches of foliaceous lichens; inner surface smooth, minutely striated, pale brownish-yellow to deep brown; fracture short and of a purplish tint in the outer layer, fibrous and pale yellow in the inner layer; odor distinct; taste somewhat aromatic, sweetish and bitter; when chewed, imparting to the saliva a yellow color.

COMPOSITION.—Fresh bark contains a glucoside, *Frangulin*, $C_{20}H_{20}O_{10}$. This in the old bark has become converted into *Emodin*, $C_{15}H_{10}O_5$ (also found in Rhubarb), to which the value of the bark is due. Two products are obtained from Frangulin by hydrolysis, *Emodin* and *Rhamnose*, $C_6H_{12}O_5$.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Frangulæ.—Fluidextract of Frangula. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 1 c.c. (15 ♏).

ACTION.

When fresh it is a violent gastro-intestinal irritant, but when kept a year, a mild laxative, acting like senna.

USES.

For children and in cases of chronic constipation.

thick; outer surface reddish-brown, freq
with grayish or whitish lichens, several of whic
and with small groups of their brownish fruit-he
to light brownish, becoming dark brown with ag
longitudinally striate; fracture short, with proje
inner bark, and the medullary rays forming con
tinct; taste bitter and slightly acrid.

Composition.—The chief constituents are—(
said to be identical with Frangulin (*see* above).
Acids. (4) A volatile oil. The fresh bark causes
unpleasant effect is lost if the bark is kept and pro

Dose, 1 gm. (15 gr.).

Preparations.

1. Extractum Rhamni Purshianæ.—Extr
Purshiana. By maceration and percolation
Water; evaporation, and addition of powdered G
Russian).

Dose, 0.250 gm. = 250 milligm. (4 gr.).

2. Fluidextractum Rhamni Purshianæ.—
Rhamnus Purchiana. By maceration and perc
hol and Water, and evaporation.

Dose, 1 c.c. (15 ♏).

3. Fluidextractum Rhamni Purshianæ Ar
matic Fluidextract of Rhamnus Purshiana.
1000; Glycyrrhiza, 100; Magnesium Oxide, 12
Compound Spirit of Orange, 10. By maceratio
with Alcohol and Water, and evaporation
sufficient Diluted Al

USES.

Especially for habitual constipation and cases of dyspepsia accompanied by constipation. As the condition improves, the quantity required daily may usually be gradually reduced.

ALOE.

ALOES.—The inspissated juice of the leaves of *Aloe vera* (Linné) Webb, *Aloe Chinensis* Baker, *Aloe Perryi* Baker, or other species of Aloe (Fam. *Liliaceæ*). *Habitat.*—Island of Barbadoes; Eastern Africa, and other oriental regions.

CHARACTERS.—In yellowish-brown or orange-brown to blackish-brown opaque masses; translucent in thin fragments; fracture uneven, dull and waxy, somewhat resinous, or smooth and glassy, somewhat conchoidal; occasionally exhibiting microscopic crystals of Aloin; odor characteristic; taste nauseous, bitter. It gives a reddish color with Nitric Acid or with solutions of the alkalies.

COMPOSITION.—(1) *Aloin, see* below. (2) A Resin. (3) A trace of Gallic Acid. (4) A trace of a volatile oil giving the odor. *Resembling Aloes.*—Resins of Jalap, Guaiacum and Gambir.

IMPURITIES.—Gum, dextrin, inorganic matters.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Preparations.

1. **Aloe Purificata.**—Purified Aloes. Aloes, 1000; Alcohol, 200. Heat, strain, and evaporate.

CHARACTERS.—In irregular, brittle pieces, of a dull brown or reddish-brown color, and having the peculiar odor of Aloes. It is almost entirely soluble in Alcohol.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Purified Aloes is contained in Extractum Colocynthidis Compositum, Pilulæ Rhei Compositæ and Tinctura Benzoini Composita.

2. **Extractum Aloes.**—Extract of Aloes. Aloes; by disintegration by boiling in water, filtration and evaporation.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

3. **Pululæ Aloes.**—Pills of Aloes. Purified Aloes, 13; Soap, 13; water to make 100 pills. Each pill contains .13 gm.; 2 gr., of Aloes.

Dose, 2 pills.

4. **Pilulæ Aloes et Ferri.**—Pills of Aloes and Iron. Purified Aloes, 7; Exsiccated Ferrous Sulphate, 7; Aromatic Powder, 7 gm.;

2 gr., of Aloes.

Dose, 2 pills.

6. Pilulæ Aloes et Myrrhæ.—Pills of
fied Aloes, 13; Myrrh, 6; Aromatic Powd
cient quantity to make 100 pills. Each pi
of Aloes.

Dose, 2 pills.

7. Tinctura Aloes.—Tincture of Aloes
Glycyrrhiza, 200. Macerate with Diluted
to 1000.

Dose, 2 c.c. (30 ♏).

8. Tinctura Aloes et Myrrhæ.—Tincture
Synonym.—Elixir Proprietatis Paracelsi.
Myrrh, 100; Glycyrrhiza, 100. Macerate wit
and percolate to 1000.

Dose, 2 c.c. (30 ♏).

ALOINUM.—Aloin. A neutral principle obt
ing more or less in chemical composition and pl
ing to the source from which it is derived. Chiefl
Aloes.

CHARACTERS.—A micro-crystalline powder, or
lemon-yellow to dark yellow in color, possessing a
an intensely bitter taste. It is slightly hygrosco
yielding 1 molecule of water of crystallization at 100°
Aloin from Curaçao Aloes is almost completely so
water, 10.75 of Alcohol, 664 of Ether, 4260 of Chlo
1475 of Petroleum Benzin, and 21 of Acetone

IMPURITIES.—Nataloin

Action.

Stomachic; cathartic; emmenagogue; increases the flow of bile and especially stimulates the muscular coat of the large intestine.

Uses.

Chronic constipation; jaundice; amenorrhœa; thread-worms (by enema).

CLASS III.—DRASTIC PURGATIVES.

Scammony, Jalap, Croton Oil, Colocynth, Elaterin, Gamboge, Colchicum.

SCAMMONIUM.

SCAMMONY.—A gum resin obtained by incising the living root of *Convolvulus Scammonia* Linné (Fam. *Convolvulaceæ*). *Habitat.*—Western Asia.

Characters.—In circular cakes or irregular, angular pieces of various sizes, greenish-gray or brownish-black, often covered with a grayish-white powder; very brittle, breaking with an angular fracture, porous and of a resinous lustre; internally of a uniform brownish-black color, more or less translucent in thin fragments; odor peculiar, somewhat cheese-like; taste slightly acrid.

Impurities.—Chalk and Starch.

Composition.—The chief constituents are—(1) The resin (*see* below), 75 to 80 per cent. (2) Gum, 10 to 20 per cent. (3) Starch.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Preparation.

Resina Scammonii.—Resin of Scammony.

Source.—Digest Scammony with successive portions of boiling Alcohol, distil off the Alcohol, precipitate the Resin with water, wash it thoroughly, and dry with gentle heat.

Characters.—Yellowish-brown or brownish-yellow masses or fragments, breaking with a glossy, resinous fracture, translucent at the edges; or a yellowish-white or grayish-white powder, having a faint, peculiar odor, and a slight, peculiar taste. *Solubility.*—In Alcohol in all proportions; completely soluble in Oil of Turpentine; almost completely in Ether and Chloroform. Ammonia Water and solutions of alkalies dissolve it with the aid of a gentle heat.

It is an energetic hydragogue
powerfully stimulating the intes
cause violent gastro-enteritis.

Us

Obstinate constipation; impact
tions, such as mania; as a vermif
properties, it is usually combined
active purgative.

JALAP

JALAP.—The dried tuberous root o
Bentham (Fam. *Convolvulaceæ*), yieldi
7 per cent. of total resin, of which not
soluble in Ether. *Habitat.*—Eastern Me

CHARACTERS.—Napiform, pyriform or
to 5 cm. in diameter, the large roots oft
dark brown, with lighter-colored spots, a
compact; internally dark brown, with r
posed of small resin cells; fracture resi
slight, but peculiar, smoky and sweetish;

COMPOSITION.—The chief constituents
below), 7 to 22 per cent. mostly *Jalapurg*

Dose, 1 gm. (15 gr.).

Preparatio

1. Pulvis [illegible]

yellowish-gray to yellowish-brown powder, having a slight, peculiar odor, and a somewhat acrid taste. Permanent in the air. *Solubility.*—In Alcohol in all proportions; insoluble in Carbon Disulphide, Benzene, and fixed or volatile oils. Its alcoholic solution has a faintly acid reaction to blue litmus paper. Not more than 15 per cent. of Resin of Jalap should be soluble in Ether, and not more than 35 per cent. in Chloroform. Slowly but completely soluble in 5 times its weight of Ammonia Water.

COMPOSITION.—The chief constituents are—(1) *Jalapurgin*, or Convolvulin, $C_{62}H_{100}O_{32}$, a glucoside, a hard substance insoluble in Ether, more irritant than *Jalapin*, and probably the most active ingredient of Jalap. (2) *Jalapin*, probably identical with *Scammonin*. This is a soft resinous substance, soluble in Ether. It is found in Jalap wood and Jalap stalk. (3) Starch and Gum. *Resembling Jalap Resin.*—Aloes, which is bitter.

IMPURITIES.—Saponifiable substances, rosin, guaiac and other resins.

Dose, 0.125 gm. =125 milligm. (2 gr.).

Resin of Jalap is contained in Pilulæ Catharticæ Compositæ and Pilulæ Catharticæ Vegetabiles.

ACTION.

Much the same as that of scammony, but it is somewhat less powerful and produces less colic, while it promotes even greater intestinal secretion. It is thought also to have diuretic properties.

USES.

All forms of dropsy, and especially that from Bright's disease; as a cathartic at the beginning of acute diseases and in various forms of cerebral congestion. It is contra-indicated in all inflammatory states of the alimentary canal.

OLEUM TIGLII.

CROTON OIL.—A fixed oil expressed from the seed of *Croton Tiglium* Linné (Fam. *Euphorbiaceæ*). It should be kept in small, well-stoppered bottles, and should be handled with caution. *Habitat.*—India and Philippine Islands; cultivated.

CHARACTERS.—A pale yellow or brownish-yellow, somewhat viscid, and slightly fluorescent liquid, having a slight fatty odor and a mild, oily, afterwards acrid and burning taste; *great caution is necessary in tasting it.* Sp. gr., 935 to 950. *Solubility.*—When fresh, in from 55 to 60 parts of

acids, both free and combine
a substance which is non-purgati
irritation.

IMPURITIES.—Other non-drying

Dose, 0.05 c.c. (1 m).

Croton seeds are not official, but it
are 13 mm. long, 8 mm. broad, ovoi
brown shell, which on scraping beco
oily. They yield 50 to 60 per cent. of
bumin, *Crotin*, less poisonous than *Ri*
They are known from Castor-oil seeds,
the Castor-oil seeds are bright, polishec

ACTION

An irritant of extraordinary po
vesication, followed by pustulation, v
of the surrounding tissue, and when s
est doses, marked gastro-enteritis,
single drop causes purgation, attend

USES.

Externally as a counter-irritant,
chest and of the joints, and as a stim
also in obstinate cases of ringwor
cathartic in such cases
eclam

COLOCYNTHIS.

COLOCYNTH. *Synonyms.*—Bitter Apple. Bitter Gourd. Bitter Cucumber. The peeled dried fruit of *Citrullus Colocynthis*, Schrader (Fam. *Cucurbitaceæ*). *Habitat.*—Southern and Western Asia, Northern and Southern Africa, Greece and Spain.

CHARACTERS.—Globular, from 5 to 10 cm. in diameter, white or yellowish-white; light, spongy, separable longitudinally into three carpels, each containing near the outer surface numerous ovoid, compressed, whitish or light-brown seeds; odor slight; taste intensely bitter. The seeds should be separated and rejected.

IMPURITIES.—Seeds and cortex.

COMPOSITION.—The chief constituents are—(1) *Colocynthin*, $C_{56}H_{34}O_{23}$, about 2 per cent., an amorphous or crystalline, bitter, active glucoside, readily soluble in water and Alcohol. (2) Resinous matter having the names of *Citrullin*, *Colocynthein* and *Colocynthitin*, insoluble in water.

Dose, 0.065 gm. =65 milligm. (1 gr.).

Preparations.

1. **Extractum Colocynthidis.**—Extract of Colocynth. By maceration with Diluted Alcohol, expression and straining; percolation and evaporation.

Dose, 0.030 gm. =30 milligm. (½ gr.).

2. **Extractum Colocynthidis Compositum.**—Compound Extract of Colocynth. Extract of Colocynth, 160; Purified Aloes, 500; Cardamom, 60; Resin of Scammony, 140; Soap, 140; Alcohol, 100. By melting, straining and reducing to powder.

Dose, 0.500 gm. =500 milligm. (7½ gr.).

3. **Pilulæ Catharticæ Compositæ.**—Compound Cathartic Pills. Mild Mercurous Chloride, 60; Compound Extract of Colocynth, 80; Resin of Jalap, 20; Gamboge, 15; Diluted Alcohol, a sufficient quantity, to make 1000 pills.

Dose, 2 pills.

4. **Pilulæ Catharticæ Vegetabiles.**—Vegetable Cathartic Pills. Compound Extract of Colocynth, 60; Extract of Hyoscyamus, 30; Extract of Jalap, 20; Extract of Leptandra, 15; Resin of Podophyllum, 15; Oil of Peppermint, 8; Diluted Alcohol, to make 1000 pills.

Dose, 2 pills.

ACTION.

In small doses it acts as a simple bitter; in large doses it is a powerful intestinal stimulant, augmenting the biliary and intesti-

... perhaps the most ge
cathartics, but it is of great importar
istered in carefully regulated doses a
other remedies; on account of the gı
never be given by itself. In cerebral
as a revulsive.

ELATERINUM

ELATERIN.—$C_{20}H_{28}O_5 = 345.60$. A neu
Elaterium, a substance deposited by the jui
Elaterium (Linné) A. Richard (Fam. *Cucurbit*
Cucumber.

SOURCE.—Exhaust Elaterium with Chlorofo
resulting precipitate with Ether; purify by re-
form.

CHARACTERS.—Minute, white, hexagonal sc
without odor, and having a slightly acrid, bitt
air. *Solubility.*—In 262 parts of Alcohol, 318 o
272 of Benzene, and 200 of Amyl Alcohol; in 75
(140° F.); insoluble in water.

Dose, 0.005 gm. =5 milligm. ($\frac{1}{10}$ **gr.**).

Preparation.

Trituratio Elaterini.—Trituration of E
Sugar of Milk, 90.

Dose, 0.030 gm. =30 milligm. ($\frac{1}{2}$ **gr.**).

Uses.

It is the most efficient of the hydragogue cathartics in general dropsy and in ascites; also used with advantage in uræmia.

CAMBOGIA.

GAMBOGE.—A gum resin obtained from *Garcinia Hamburii* Hooker filius (Fam. *Guttiferæ*). *Habitat.*—Anam, Camboja and Siam.

Characters.—In cylindrical pieces, usually hollow in the centre, of variable length, 2 to 5 cm. in diameter, externally grayish orange-brown, longitudinally striate; fracture conchoidal, waxy, orange-red, and somewhat porous; inodorous; taste very acrid. Powder bright yellow, sternutatory. *Solubility.*—Not more than 25 per cent. should be insoluble in Alcohol.

Composition.—The chief constituents are—(1) A brilliant yellow Resin, *Gambogic Acid*, 65 to 80 per cent. (2) Gum, 16 to 26 per cent. This is soluble, so that an emulsion of Gambogic Acid is formed with water.

Impurities.—Starch, woody fibre.

Dose, 0.125 gm. = 125 milligm. (2 gr.)

Gamboge is contained in Pilulæ Catharticæ Compositæ.

Action.

It is a violent hydragogue cathartic; also an anthelmintic; small and repeated doses are slightly diuretic.

Uses.

As its action is somewhat uncertain, and when it does take place is very severe, it is not often prescribed except as the official pill into which it enters. It should always be given in combination with other remedies.

COLCHICUM.

COLCHICI CORMUS.—Colchicum Corm. The dried corm of *Colchicum autumnale* Linné (Fam. *Liliaceæ*), yielding, when assayed, not less than 0.35 per cent. of Colchicine. *Synonyms.*—Colchicum Root. Meadow Saffron. *Habitat.*—Southern and Central Europe.

Characters.—Ovoid, somewhat compressed laterally, and with a groove on one side, or, more commonly, in transverse, reniform, or longitudinal, ovate slices; externally brownish and finely wrinkled; internally whitish, with numerous circular groups of fibro-vascular bundles, giving the surfaces of the transverse sections a papillose appearance; fracture short, mealy; odor slight; taste sweetish, bitter and somewhat acrid.

Composition.—The chief constituents are—(1) *Colchicine*, $C_{22}H_{25}NO_6$,

Extractum Colchici Cormi.—E
By maceration and percolation with
evaporation.

Dose, 0.065 gm. = 65 milligm. (1

COLCHICI SEMEN.—Colchicum Seed.
nale yielding, when assayed, not less than 0.

CHARACTERS.—Subglobular, about 2 m
pointed at the hilum; externally reddish b
whitish; tough and of almost bony hardness;
and somewhat acrid. *Resembling Colchicum*

COMPOSITION.—The chief constituents are
corm. It should yield at least 0.55 per cent.
chicine. (2) A fixed oil, 6 to 8 per cent.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

Preparations.

1. Fluidextractum Colchici Seminis.-
chicum Seed. By maceration and percola
Water, and evaporation.

Dose, 0.2 c.c. (3 ♏).

2. Tinctura Colchici Seminis.—Tinctu
Colchicum Seed, 100; by maceration and
hol and Water to 1000.

Dose, 2 c.c. (30 ♏).

3. Vinum Colchici Seminis.—Wine of C
extract of Colchicum Seed, 100; by ma
150; and with White Wine to 1000.

Dose, 2 c.c. (30 ♏).

dissolve out Colchicine with Alcohol. Colchicine may also be built up synthetically from Colchiceine, Sodium Methylate, and Methyl Iodide, which are heated together.

CHARACTERS.—Pale yellow leaflets, or a pale yellow, amorphous powder, turning darker on exposure to light, and having an odor suggesting damp hay and a very bitter taste. *Solubility.*—In 22 parts of water, 155 of Ether, and 87 of Benzene; very soluble in Alcohol and Chloroform; insoluble in Petroleum Benzin.

INCOMPATIBLES.—Those common to all alkaloids. (*See* Atropine.)

Dose, 0.0005 gm. = 0.5 milligm. ($\frac{1}{120}$ **gr.**).

Unofficial Preparation.

Colchicinæ Salicylas.—Colchicine Salicylate. *Synonym.*—Colchisal. A yellow, amorphous powder, soluble in water, Alcohol and Ether.

Dose, .0006 gm. ($\frac{1}{100}$ **gr.**).

ACTION.

Large amounts cause salivation and marked gastro-intestinal irritation, followed by collapse; small doses are diuretic and increase the elimination of uric acid.

USES.

Almost exclusively in gout, in which it is generally an efficient remedy; in headache, neuralgia, dyspepsia, eczema, conjunctivitis, bronchitis and other affections occurring in gouty subjects it is sometimes useful.

CLASS IV.—CHOLAGOGUES.

Podophyllum, Leptandra, Euonymus.

PODOPHYLLUM.

PODOPHYLLUM. *Synonyms.*—May Apple. Mandrake. The dried rhizome of *Podophyllum peltatum* Linné (Fam. *Berberidaceæ*). *Habitat.*—North America, in rich woods and thickets.

CHARACTERS.—Of horizontal growth and variable length, subcylindrical, flattened above, sometimes branched, consisting of joints 5 to 10 cm. long, the internodes 2 to 8 mm. thick; externally pale yellowish-brown to dark brown, nearly smooth; nodes annulate, the upper surface being marked by large cup-shaped scars, the lower surface with numerous root-scars or remains of roots; fracture short, the fractured surface mealy or horny, whitish to pale brown, with a circle of small wood-bundles, and a

large pith; (r slight, more pronounced and characteristic in the powder; taste sweetish and disagreeably bitter and acrid.

COMPOSITION.—The chief constituents are—(1) The official *Resin* (*see* below), 4 to 5 per cent. (2) Podophyllic Acid, a coloring principle.

Dose, 0.500 gm. =500 milligm. (7½ gr.).

Preparations.

1. **Flu iextractum Podophylli.**—Fluidextract of Podophyllum. By with Alcohol and Water, distillation

Dose, 0.

2. **Pil t Capsici.**—Pills of Podophyllum, Resin of Podophyllum, 1.6; Extr. .8; Capsicum, 3.2; Sugar of Milk, (l Syrup, each, a sufficient quantity t

Dose, 1 pill.

3. **Resina Podophylli.**—Resin of Podophyllum. *Synonym.*—Podophyllin.

SOURCE.—By maceration and percolation in Alcohol, distillation of the Alcohol, precipitation of Resin in Hydrochloric Acid and Water; wash and dry.

CHARACTERS.—An amorphous powder, varying in color from grayish-white to pale greenish-yellow or yellowish-green, turning darker when subjected to a heat exceeding 35° C. (95° F.) or when exposed to light; having a slight, peculiar odor, and a faintly bitter taste. *Solubility.*—In Alcohol in all proportions; not less than 75 per cent. of it should be soluble in Ether, not less than 65 per cent. in Chloroform, and not more than 25 per cent. in boiling water.

COMPOSITION.—The Resin consists mainly of *Podophyllotoxin*, $C_{23}H_{24}O_9 + 2H_2O$, which is said to be a mixture of *Picropodophyllin*, 75 to 80 per cent., the purgative principle, and Picropodophyllic Acid, both existing free in the rhizome; with these are associated minor resins, and Podophylloquercitin, a coloring principle.

INCOMPATIBLES.—Water precipitates it from Alcohol; acids precipitate it from Ammonia.

Dose (purgative), **0.015 gm. =15 milligm.** (¼ **gr.**); (laxative) **0.005 gm. =5 milligm.** ($\frac{1}{16}$ **gr.**).

Resin of Podophyllum is contained in Pilulæ Catharticæ Vegetabiles.

Action.

A drastic, cholagogue cathartic, slowly-acting like aloes. Large doses cause marked gastro-intestinal irritation.

Uses.

Constipation with hepatic derangement generally; so-called bilious attacks; congestion of the portal circulation; catarrhal and malarial jaundice; ascites; hæmorrhoids; habitual constipation from inactivity of the muscular coat of the intestine. With it belladonna, nux vomica, or hyoscyamus is often combined to prevent griping.

LEPTANDRA.

LEPTANDRA. *Synonym.*—Culver's Root. The dried rhizome and roots of *Veronica virginica* Linné (Fam. *Scrophulariaceæ*). *Habitat.*—United States, south to Georgia, and west to Minnesota, in low grounds.

Characters.—Rhizome of horizontal or oblique growth, somewhat bent and branched, from 4 to 15 cm. long, and 3 to 8 mm. in diameter; externally gray-brown to blackish-brown, with cup-shaped scars on the upper side; annulate, the inferior and lateral surfaces with coarse roots and root-scars; fracture tough and woody, branches readily separable from the main rhizome; internally, bark brown, 0.3 to 1 mm. thick, wood hard, yellowish, pith large, purplish-brown; roots slender, longitudinally wrinkled, fragile; odor slight; taste bitter, slightly acrid.

Composition.—The chief constituents are—(1) Leptandrin, a bitter, crystalline glucoside. (2) A saccharine principle having the properties of Mannite. (3) Possibly a volatile alkaloid.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Extractum Leptandræ.**—Extract of Leptandra. By evaporation of the Fluidextract to dryness, and the addition of powdered Glycyrrhiza (peeled, Russian).

Dose, 0.250 gm.=250 milligm. (4 gr.).

Extract of Leptandra is contained in Pilulæ Catharticæ Vegetabiles.

2. **Fluidextractum Leptandræ.**—Fluidextract of Leptandra. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 1 c.c. (15 ♏).

EUONYMUS. *Synonyms.*—Wahoo. Spin
of the root of *Euonymus atropurpureus* Jacqui
itat.—United States, southward to Florida,
in shady woods.

CHARACTERS.—In quilled or curved pieces,
5 mm. thick; outer surface ashy or pale brow
scaly patches of soft cork; inner surface whitis
fracture short, whitish, with projecting, silky,
distinct; taste sweetish, bitter and somewhat ac

COMPOSITION.—The chief constituents are—(
phous resin, very bitter. (2) *Atropurpurin*, a c
Citric, Tartaric and Malic Acids.

Dose, 0.500 gm.=500 milligm. (7½ gr.).

Preparations.

1. **Extractum Euonymi.**—Extract of Eu
—Euonymin. By the evaporation of the Fl
addition of powdered Glycyrrhiza (peeled, F
Dose, 0.125 gm.=125 milligm. (2 gr.).

2. **Fluidextractum Euonymi.**—Fluidextr
By maceration and percolation with Alcoh
evaporation.
Dose, 0.5 c.c. (8 ♏).

ACTION.

It is an energetic purgative and a gastric a
also slightly diuretic and expe

GROUP VI.—Drugs Having Chiefly a Diuretic Action.

Uva Ursa, Apocynum, Zea, Triticum, Marrubium, Pareira, Chimaphila, Sabal, Benzoin, Fabiana.

UVA URSI.

UVA URSI. *Synonym.*—Bearberry. The dried leaves of *Arctostaphylos Uva-ursi* (Linné) Sprengel (Fam. *Ericaceæ*). *Habitat.*—Northern Hemisphere, in dry and sandy or rocky places; in the United States, south to Pennsylvania, New Mexico, and California.

CHARACTERS.—Obovate or oblong-spatulate, 15 to 30 mm. long, obtuse, slightly revolute on the margin, tapering into a very short and stout petiole, coriaceous; upper surface dark green, finely reticulate; lower surface slightly pubescent; odor faint; taste strongly astringent and somewhat bitter. *Resembling Uva Ursi.*—Senna and Buchu.

COMPOSITION.—The chief constituents are—(1) *Arbutin*, $C_{12}H_{16}O_7$, a bitter, crystalline glucoside yielding glucose, hydroquinone and methyl-hydroquinone. (2) *Ericolin*, $C_{10}H_{16}O$, a bitter, crystalline glucoside. (3) Ursone, a tasteless neutral body. (4) Tannic Acid, 6 to 7 per cent. (5) Gallic Acid.

INCOMPATIBLES.—Iron, lead and silver salts, gelatin, opium, infusion of cinchona, spirit of nitrous ether, alkalies, tartar emetic.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Uvæ Ursi.—Fluidextract of Uva Ursi. By maceration and percolation with Glycerin, Alcohol and Water, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Tonic; astringent; diuretic; large doses commonly cause vomiting and purging. It has an anti-putrefactive effect upon the urine.

USES.

Pyelitis; cystitis; urethritis; *ardor urinæ* in gonorrhœa; incontinence of urine; dysuria; strangury; uterine hæmorrhages. Arbutin (dose, .20 gm.; 3 gr.) has been successfully employed in gonorrhœa and as a diuretic in cardiac dropsy.

APOCYNUM.

APOCYNUM. *Synonym.*—Canadian Hemp. The dried rhizome of *Apocynum cannabinum* Linné (Fam. *Apocynaceæ*). *Habitat.*—United States, on the border of thickets and in grassy places.

[illegible]ous; almost inodorous, the taste sta
and somewhat acrid.

COMPOSITION.—The chief constituents
side, soluble in water, acting like digitalin
resinous glucoside.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Apocyni.—Fluidex
maceration and percolation with Glyc
and evaporation.

Dose, 1 c.c. (15 ♏).

ACTION.

It is an efficient diuretic and has, in a
bling that of strophanthus; in large doses i
tic.

USES.

Especially in dropsy.

ZEA.

ZEA. *Synonym.*—Corn-silk. The fresh s
Mays Linné (Fam. *Gramineæ*). *Habitat.*—T
in the warm, temperate zone.

CHARACTERS.—A matted mass of slender fi
thread-like, yellowish or brownish; nearly inod
with a characteristic flavor.

COMPOSITION.—Its chief constituents are
per cent. (2) Fixed oil

TRITICUM.

TRITICUM. *Synonym.*—Couch-Grass. The dried rhizome of *Agropyron repens* (Linné) Beauvois (Fam. *Gramineæ*), gathered in the spring. *Habitat.*—Europe and North America.

CHARACTERS.—Of horizontal growth, subcylindrical, 1 to 2 mm. in diameter, usually cut into sections 5 to 8 mm. long; externally brownish-yellow to straw-colored, nearly smooth; hollow in the centre; odor slight; taste distinctly sweet.

COMPOSITION.—(1) Triticin, about 8 per cent., a gummy substance resembling Inulin. (2) Inosit. (3) Malates.

Dose, 8 gm. (120 gr.).

Preparation.

Fluidextractum Tritici.—Fluidextract of Triticum. By percolation with boiling water, evaporation, addition of Alcohol and filtration.

Dose, 8 c.c. (2 fl. dr.).

ACTION.

Emollient and demulcent but probably not diuretic.

USES.

Dysuria, irritability of the bladder, chronic cystitis, gleet, irritable prostate, and other affections of the genito-urinary tract.

MARRUBIUM.

MARRUBIUM. *Synonym.*—Horehound. The dried leaves and flowering tops of *Marrubium vulgare* Linné (Fam. *Labiatæ*). *Habitat.*—Europe, Central Asia; naturalized in North America; cultivated.

CHARACTERS.—Branches quadrangular, grayish-green, densely white-hairy; leaves opposite, petiolate, roundish-ovate, 1.5 to 5 cm. long, obtuse, coarsely crenate, strongly rugose-veined, more or less white-hairy, especially underneath; flowers in dense axillary whorls, with a 10-toothed calyx, the divisions of which are slightly unequal, erect-spreading and pungent corolla small, whitish, bilabiate; stamens four, included; fruit of four ovoid, obtuse, nearly smooth nutlets, about 1.5 mm. long; odor distinct, rather agreeable; taste somewhat aromatic and bitter.

COMPOSITION.—(1) *Marrubiin*, possibly a glucoside, in crystalline scales or prisms, soluble in Ether, Chloroform and Alcohol. (2) Volatile Oil, in small amount. (3) Resin.

Dose, 2 gm. (30 gr.).

...oat of public speakers.

PAREIRA. *Synonym.*—Pareira Brava
dendron tomentosum Ruiz et Pavon (Fam
Brazil.

CHARACTERS.—Subcylindrical, knotty an
pieces of various lengths, 1 to 6 cm. in diame
with transverse ridges and fissures and long
and tough; when freshly cut, having a wax
or brownish-gray, the dried transverse sections
ally concentric circles of interrupted, porous wo
the markedly retracted intervening tissue of
rays, and no distinct central pith; odor slight;

COMPOSITION.—The chief constituent is *Pe*
0.5 per cent., identical with Berberine (*see* p. 327

INCOMPATIBLES.—Ferric and lead salts, tinct

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Pareiræ.—Fluidextract
eration and percolation with Glycerin, Al
evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Diuretic, acting like buchu.

Chronic

CHARACTERS.—Oblanceolate, 2.5 to 5 cm. long, 8 to 18 mm. broad, the upper portion coarsely and sharply serrate, acute or somewhat obtuse, the lower wedge-shaped and nearly entire; coriaceous, smooth, and uniformly dark-green on the upper surface, paler beneath, the veins being very prominent; odor slight; taste astringent and bitter.

COMPOSITION.—(1) *Arbutin* (*see* p. 317). (2) *Ericolin*. (3) *Chimaphilin*, in yellow, tasteless, volatile crystals. (4) Ursone. (5) Tannic Acid, 4 per cent.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Chimaphilæ.—Fluidextract of Chimaphila. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Probably diuretic and diapheretic.

USES.

Rheumatism; nephritic affections.

SABAL.

SABAL.—The partially dried ripe fruit of *Serenoa serrulata* (Roemer and Shultes) Hooker filius (Fam. *Palmæ*).

CHARACTERS.—Irregularly spherical to ovoid; 10 to 25 mm. long, 10 to 15 mm. in diameter; externally blackish-brown, shriveled, somewhat oily; epicarp thin; sarcocarp about 1 mm. thick, greenish-yellow, soft-spongy; endocarp thin, friable; seed hard, chocolate-brown; odor aromatic; taste sweetish, acrid and oily.

COMPOSITION.—(1) *Volatile Oil*, having a green color and an old-cheese odor, ½ to 1 per cent. (2) *Fixed Oil*, thought to be composed of two portions, one being of a light lemon color and the other a greenish-brown, 12 to 15 per cent. (3) *Alkaloid*. (4) *Resin*. (5) *Dextrin*. (6) *Glucose*.

Dose, 1 gm. (15 gr.).

Unofficial Preparation.

Fluidextractum Sabal.—Fluidextract of Sabal. By maceration and percolation with Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

ACTION.

Diuretic; expectorant; sedative.

Uses.

Catarrhal conditions in general; affections of the respiratory and genito-urinary tracts; cardiac asthma.

BENZOINUM.

BENZOIN. *Synonym.*—Gum Benjamin. A balsamic resin obtained from *Styrax Benzoin* Dryander, and another unidentified species of *Styrax* (Fam. *Styraceæ*). *Habitat.*—Sumatra, Java and Siam.

Characters.—In pebble-like bodies or tears, mostly 0.5 to 5 cm. long and about one-fourth as thick, slightly flattened, straight or curved, yellowish- to rusty-brown externally, milky-white on fresh fracture, separate or very slightly agglutinated (Siam Benzoin), or embedded in a dry resinous mass, which varies from reddish-brown to reddish-gray or grayish-brown, is opaque or slightly translucent and more or less lustrous (Sumatra Benzoin); brittle, becoming soft on warming, and yielding benzoic acid on sublimation; odor agreeable, balsamic (vanilla-like in the Siam variety); taste slightly acrid. *Solubility.*—Almost wholly in 5 parts of warm Alcohol, the solution showing an acid reaction; soluble in solutions of Sodium or Potassium Hydroxide.

Composition.—The chief constituents are—(1) *Benzoic Acid* (*see* below), 12 to 20 per cent. (2) *Cinnamic Acid*, $C_9H_8O_2$, a trace. (3) Resin. (4) Volatile Oil.

Dose, 1 gm. (15 gr.).

Preparations.

1. Adeps Benzoinatus.—Benzoinated Lard. Benzoin, 20; Lard, 1000; by melting and straining.

2. Tinctura Benzoini.—Tincture of Benzoin. Benzoin, 200; by maceration and filtration with Alcohol to 1000.

Dose, 1 c.c. (15 ♏).

3. Tinctura Benzoini Composita.—Compound Tincture of Benzoin. *Synonym.*—Friar's Balsam. Benzoin, 100; Storax, 80; Balsam of Tolu, 40; Purified Aloes, 20; by digestion with Alcohol, and filtration to 1000.

Dose, 2 c.c. (30 ♏).

ACIDUM BENZOICUM.—Benzoic Acid. $HC_7N_5O_2 = 121.13$. An organic acid ($C_6H_5 \cdot COOH$) obtained from Benzoin by sublimation, or prepared synthetically. It should be kept in dark, amber-colored, well-stoppered bottles, in a cool place.

Source.—Toluene (toluol) is generally the source of this substance.

Characters.—White, or yellowish-white, lustrous scales or friable

needles, nearly odorless, or having a slight, characteristic odor resembling that of Benzoin, and of an acid, pungent taste; somewhat volatile at a moderately warm temperature, and becoming yellow on exposure to light. *Solubility.*—In 281 parts of water and 15 of boiling water; in 1.8 parts of Alcohol, 3 of Ether, and 7 of Chloroform; readily soluble in Carbon Disulphide, Benzene, fixed and volatile oils; sparingly in Petroleum Benzin.

IMPURITIES.—Chlorine, cinnamic acid, readily carbonizable organic matters.

Dose, 0.500 gm.=500 milligm. (7½ gr.).

Benzoic Acid is contained in Liquor Antisepticus and Tinctura Opii Camphorata.

AMMONII BENZOAS.—Ammonium Benzoate. $NH_4C_7H_5O_2 = 138.06$. It should contain not less than 98 per cent. of pure Ammonium Benzoate, $C_6H_5 \cdot COONH_4$.

SOURCE.—Dissolve Benzoic Acid in Water of Ammonia and distilled water, and evaporate, set aside to crystallize. $HC_7H_5O_2 + NH_4OH = NH_4C_7H_5O_2 + H_2O$.

CHARACTERS.—Thin, white, laminar crystals or a crystalline powder, odorless or having a slight odor of Benzoic Acid, of a saline, bitter, afterwards slightly acrid taste, and gradually losing Ammonia on exposure to air. *Solubility.*—In about 10.5 parts of water and 28 of Alcohol; in 1.2 parts of boiling water and 7.6 of boiling Alcohol.

IMPURITIES.—The chloride and sulphate, heavy metals, and the impurities of benzoic acid.

INCOMPATIBLES.—Ferric salts, acids, solution of potassium hydroxide.

Dose, 1 gm. (15 gr.).

LITHII BENZOAS.—Lithium Benzoate. $LiC_7H_5O_2 = 127.11$. It should contain not less than 98.5 per cent. of pure Lithium Benzoate, $C_6H_5 \cdot COOLi$.

SOURCE.—By decomposing Lithium Carbonate with Benzoic Acid. $Li_2CO_3 + 2HC_7H_5O_2 = 2LiC_7H_5O_2 + CO_2 + H_2O$.

CHARACTERS.—A light, white powder, or small, shining, crystalline scales; odorless, or of a faint benzoin-like odor, and of a cooling, sweetish taste; permanent in the air. *Solubility.*—In 3 parts of water and 13 of Alcohol.

IMPURITIES.—Other alkalies, iron, aluminum, heavy metals, and the impurities of Benzoic Acid.

Dose, 1 gm. (15 gr.).

SODII BENZOAS.—Sodium Benzoate. $NaC_7H_5O_2 = 143.01$. It should contain not less than 99 per cent. of pure Sodium Benzoate, $C_6H_5 \cdot COONa$.

SOURCE.—Benzoic Acid is added to a hot concentrated solution of pure Sodium Carbonate, the solution is evaporated, cooled and allowed to crystallize. $2HC_7H_5O_2 + Na_2CO_3 = 2NaC_7H_5O_2 + CO_2 + H_2O$.

CHARACTERS.—A white, amorphous, granular or crystalline powder, odorless and having a sweetish, astringent taste; permanent in the air. *Solubility.*—In 1.6 parts of water, in 43 of Alcohol, and in 12 of boiling Alcohol.

IMPURITIES.—Heavy metals and the impurities of Benzoic Acid.

Dose, 1 gm. (15 gr.).

ACTION.

Antiseptic; irritant; stimulant to the heart, respiration and liver; expectorant; diuretic. The acidity of the urine is increased, the genito-urinary tract is disinfected and stimulated, and occasionally urticaria or an erythematous rash is produced.

USES.

Locally, wounds, ulcers, sinuses, etc.; chilblains; the itching of urticaria or eczema; chapped lips, hands or nipples; catarrhal affections of the pharynx or larynx. Internally, disordered conditions of the urine (as ammoniacal urine and phosphaturia); vesical calculi; chronic gonorrhœa; incontinence due to alkalinity of the urine; chronic Bright's disease; diarrhœal diseases; respiratory affections.

Unofficial Preparations.

Fabiana.—Pichi. The branches of the woody shrub, *Fabiana imbricata* (Fam. *Solanaceæ*). *Habitat.*—Peru and Chili.

CHARACTERS.—A woody shrub growing on rocky hill-tops, with plume-like sprays, the small densely-crowded leaves much resembling those of a conifer. The branches and leafy branchlets are resinous, with an aromatic odor and taste.

COMPOSITION.—It contains (1) *Fabianine*, a bitter alkaloid. (2) A Resin. (3) A crystalline substance. (4) An essential oil.

Preparation.

Fluidextractum Fabianæ.—Fluidextract of Fabiana. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, .30 to 2.50 c.c.; 5 to 40 ♏.

ACTION.

Diuretic.

USES.

Inflammation of the bladder and catarrh of the urinary tract; it should not be used in organic disease.

Class IV of the Volatile Oils also act on the Genito-urinary Tract.

GROUP VII.—Drugs Acting on Unstriped Muscle (Especially That of the Uterus).

Ergot, Hydrastis, Cotton Root Bark, Viburnum, Apiol.

ERGOTA.

ERGOT. *Synonym.*—Ergot of Rye. The sclerotium of *Claviceps purpurea* (Fries) Tulasne (Fam. *Hypocreaceæ*), replacing the grain of rye, *Secale cereale* Linné (Fam. *Gramineæ*). Ergot should be moderately dried, and not exposed to a damp atmosphere. *Habitat.*—Spain and Russia.

CHARACTERS.—Subcylindrical, obscurely three-angled, tapering towards both ends, but obtuse, somewhat curved, 1.5 to 3 cm. long and about 3 mm. thick; externally purplish-black, longitudinally furrowed on each side, more conspicuously on the concave side; fracture short, pinkish or reddish-white; odor peculiar, heavy; taste disagreeable.

COMPOSITION.—The chief constituents are—(1) *Ergotine*, $C_{50}H_{52}N_2O_3$, an amorphous alkaloid, feebly bitter; soluble in Alcohol and water. (2) *Ecboline*, an amorphous alkaloid, slightly bitter; soluble in water and Alcohol. (3) *Ergotinine*, $C_{35}H_{40}N_4O_6$, a crystalline alkaloid, slightly bitter. (4) *Sphacelic Acid*, known also as *Sphacelotoxin*, a non-nitrogenous, unstable body, insoluble in water, soluble in alkalies. It is believed to be the active agent in contracting the blood-vessels. (5) *Cornutine*, an active alkaloid, not only contracts the blood-vessels, but is believed to be the agent which contracts the uterus. This is the chief active constituent of alcoholic extracts of Ergot. (6) *Sclerotinic, Ergotinic or Ergotic Acid*, 1 to 4 per cent., soluble in water and alkalies, having ecbolic properties. This is really a mixture of *Sphacelic Acid* and *Cornutine*. (7) A fixed oil, 30 per cent. (8) Trimethylamine, to which the odor is due. (9) Tannic Acid. Many other bodies have been found in Ergot, but those given are believed to be the more important; the composition of Ergot is not yet certainly made out.

Dose, 2 gm. (30 gr.).

Preparations.

1. **Extractum Ergotæ.**—Extract of Ergot. *Synonym.*—Ergotin. Ergot, 1000; Diluted Hydrochloric Acid, 50; Monohydrated Sodium Carbonate, 8.5; Glycerin, 12; Alcohol and Water, each, a sufficient quantity. By maceration and percolation of the Ergot with Alcohol and water. The percolate is evaporated, water is added, and, after filtration, the Diluted Hydrochloric Acid. After filtering again, the Monohydrated Sodium Carbonate is gradually added, and when the evolution of Carbon Dioxide has ceased, the liquid is evaporated. The Glycerin is then added, and the evaporation continued.

INCOMPATIBLES.—Astringents, metallic salts in solution.

Dose, 0.250 gm. = 250 milligm (4 gr.).

2. **Fluidextractum Ergotæ.**—Fluidextract of Ergot. By maceration and percolation with Acetic Acid and Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

3. **Vinum Ergotæ.**—Wine of Ergot. Fluidextract of Ergot, 200; Alcohol, 50; White Wine, 750.

Dose, 8 c.c. (2 fl. dr.).

It is said that Ammonia is the best solvent for the active principles of Ergot. It may be extemporaneously prescribed as follows: Ergot, 1; Aromatic Spirit of Ammonia, 2. *Dose*, .60 to 4 c.c. (10 to 60 ♏).

ACTION.

Astringent; hæmostatic; excito-motor; emmenagogue; oxytocic. It increases intestinal peristalsis and causes a marked rise in blood-pressure, which is dependent on a general contraction of the arteries. One of the most prominent characteristics of ergot is its property of exciting contractions in the pregnant uterus. There are two forms of chronic poisoning, which is known as ergotism: the gangrenous and the convulsive. In the first, gangrene in various situations results from the vascular contraction; in the other, from the action on the central nervous system, there occur convulsions, often epileptiform in character, which leave as sequelæ contractures in the limbs and sometimes in the trunk muscles.

USES.

Chiefly for the purpose of insuring tonic retraction of the uterus after parturition. It is employed not only for uterine, but for

other hæmorrhages, such as hæmoptysis and intestinal hæmorrhage, and also in the treatment of aneurisms. Other uses: Maniacal disorders associated with cerebral hyperæmia, cerebro-spinal meningitis, acute myelitis, the congestive form of migraine, congestive dysmenorrhœa, incontinence of urine, spermatorrhœa, the night-sweats of phthisis, uterine fibroids and polypi.

HYDRASTIS.

HYDRASTIS. *Synonyms.*—Golden Seal. Yellow Puccoon. The dried rhizome and roots of *Hydrastis canadensis* Linné (Fam. *Ranunculaceæ*). It should yield not less than 2.5 per cent. of Hydrastine. *Habitat.*—North America, west to Missouri and Arkansas, in woodlands.

CHARACTERS.—Rhizome of oblique growth, subcylindrical, straight or somewhat tortuous, 2 to 5 cm. long and 3 to 6 mm. in diameter, with short stem remnants, or stem scars, and slightly annulate; externally brownish-gray to yellowish-brown; fracture short, waxy, deep yellow; bark about 0.5 mm. thick, wood wedges bright yellow, pith large, light yellow. Roots thin, brittle, with a thick, yellow bark and a somewhat quadrangular wood. Odor slight; taste bitter.

COMPOSITION.—It contains—(1) *Berberine*, $C_{20}H_{17}NO_4$, an alkaloid existing as yellowish prismatic crystals, which is found in many plants (Berberis, Calumba, Coptis, Menispermum, Xanthorrhiza, Xanthoxylum, etc.), chiefly in the orders *Berberidaceæ*, *Menispermaceæ*, and *Ranunculaceæ*. It is identical with Buxine, the alkaloid of *Buxus sempervirens*, and Pelosine, that of *Chondrodendron tomentosum* (Pareira). (2) The alkaloid *Hydrastine* (*see* below). (3) *Canadine*, $C_{21}H_{21}NO_4$, in white needles.

Dose, 2 gm. (30 gr.).

Preparations.

1. Fluidextractum Hydrastis.—Fluidextract of Hydrastis. By maceration and percolation with Alcohol, Glycerin and water, and evaporation.

Dose, 2 c.c. (30 ♏).

2. Glyceritum Hydrastis.—Glycerite of Hydrastis. Hydrastis, by percolation and maceration with Alcohol; distil off the Alcohol, add Water, filter, and to the filtrate add an equal volume of Glycerin.

Dose, 2 c.c. (30 ♏).

3. Tinctura Hydrastis.—Tincture of Hydrastis. Hydrastis, 200; by maceration and percolation with Alcohol and water to 1000.

Dose, 4 c.c. (1 fl. dr.).

HYDRASTINA.—Hydrastine. $C_{21}H_{21}NO_6 = 380.32$. An alkaloid obtained from Hydrastis.

CHARACTERS.—White to creamy white, glistening prisms, sometimes of large size, possessing a bitter taste, and permanent in the air. It contains no water of crystallization. *Solubility.*—Almost insoluble in water at 25° C. (77° F.); soluble in 135 parts of Alcohol, 124 of Ether, and 2 of Chloroform at 25° C. (77° F.); soluble in 4000 parts of water at 80° C. (176° F.), and in 17 parts of Alcohol at 60° C. (140° F.); easily soluble in Benzene.

IMPURITY.—Hydrastinine.

Dose, 0.010 gm. = 10 milligm. ($\frac{1}{6}$ gr.).

HYDRASTININÆ HYDROCHLORIDUM.—Hydrastinine Hydrochloride. $C_{11}H_{11}NO_2 \cdot HCl = 223.88$. The hydrochloride ($HCl \cdot C_{11}H_{11}NO_2$) of an artificial alkaloid derived from Hydrastine.

SOURCE.—By acting upon Hydrastine by oxidizing agents, as when Manganese Dioxide and Sulphuric Acid are used together, or when Platinic Chloride is employed.

CHARACTERS.—Light yellowish needles, or a pale yellow, crystalline powder; odorless, and having a bitter taste. *Solubility.*—Very soluble in hot and cold water and in Alcohol; in 286 parts of Chloroform and 1300 of Ether.

Dose, 0.030 gm.=30 milligm. ($\frac{1}{2}$ gr.).

ACTION.

It promotes appetite and digestion, increases the gastro-intestinal secretions and the flow of bile, and causes constriction of the arterioles, with a consequent rise of blood-pressure. Large doses stimulate the spinal cord like strychnine, and also weaken and paralyze the heart muscle. In consequence of the cardiac depression the blood-pressure falls, and eventually both the cord and medulla are paralyzed, death occurring from failure of the respiration. Hydrastine has decided antiperiodic properties.

USES.

Externally for subacute and chronic inflammations of the mucous membranes. Internally, gastric and intestinal catarrh; intestinal indigestion; malarial infection; dysmenorrhœa; menorrhagia and other hæmorrhages.

GOSSYPII CORTEX.

COTTON ROOT BARK.—The dried bark of the root of *Gossypium herbaceum* Linné, or of other species of *Gossypium* (Fam. *Malvaceæ*). *Habitat.*—Subtropical Asia and Africa; cultivated in the United States.

CHARACTERS.—In thin, flexible bands or quilled pieces, the bark 0.2 to 1 mm. thick; outer surface yellowish-brown, longitudinally wrinkled, with small lenticels, the periderm frequently exfoliated and somewhat fuzzy from partly detached bast fibres; inner surface whitish, longitudinally striate; fracture tough, fibrous, the bast-layer separable into thin laminæ; odor faint; taste slightly astringent and acrid.

COMPOSITION.—(1) A yellow Resin. (2) A fixed Oil. (3) Tannic Acid. (4) Yellow coloring matter.

Dose, 2 gm. (30 gr.).

ACTION.

The same as that of ergot; it is an emmenagogue and abortifacient.

USES.

As a uterine hæmostatic in menorrhagia and metrorrhagia.

VIBURNUM.

VIBURNUM PRUNIFOLIUM. *Synonym.*—Black Haw. The dried bark of the root of *Veburnum prunifolium* Linné, or of *Viburnum Lentago* Linné (Fam. *Caprifoliaceæ*). *Habitat.*—United States, westward to Kansas and Mississippi; in thickets.

CHARACTERS.—In irregular or quilled pieces, rarely exceeding 4 mm. thick; externally dingy brown, shallowly fissured and slightly scaly; inner surface rust-brown; fracture weak, short, and uneven, the inner layer whitish, the middle rust-brown, the outer dark brown; groups of stone cells readily distinguishable in transverse section; odor slight, peculiar; taste very bitter, somewhat astringent.

COMPOSITION.—Its chief constituents are—(1) A brown, bitter Resin. (2) *Viburnin*, a greenish-yellow, bitter principle. (3) *Valeric Acid.* (4) Tannic Acid. (5) Oxalates, Citrates and Malates.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Viburni Prunifolii.—Fluidextract of Viburnum prunifolium. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 2 c.c. (30 ♏).

VIBURNUM OPULUS. *Synonyms.*—Cramp Bark. High Bush Cranberry. The dried bark of *Viburnum Opulus* Linné (Fam. *Caprifoliaceæ*). *Habitat.*—North America, from New Brunswick westward, and southward to Pennsylvania, in low grounds.

CHARACTERS.—In somewhat transversely curved pieces, occasionally in quills, of variable length, and 0.5 to 2 mm. thick; outer surface grayish-brown, longitudinally wrinkled, with large brown lenticels and brownish-black fruit-heads of a lichen; inner surface light brown, longitudinally striate; fracture uneven, fibrous; transverse sections show several bands of bast fibres; odor slight; taste somewhat astringent and bitter.

COMPOSITION.—The same as of *Viburnum prunifolium.*

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Viburni Opuli.—Fluidextract of Viburnum Opulus. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Tonic; antispasmodic; diuretic.

USES.

Nervous diseases of pregnancy; to prevent miscarriage; after-pains; menorrhagia; spasmodic dysmenorrhœa.

Unofficial Preparation.

Apiolum. — Apiol. $C_{12}H_{14}O_4 = 221.48$. A substance obtained from the fruit of *Petroselinum sativum* (Fam. *Umbelliferæ*). *Synonym.*—Parsley. *Habitat.*—Southern Europe; cultivated.

SOURCE.—The fruit is exhausted with Petroleum Benzin, the solvent evaporated, the residue treated with strong Alcohol, on the evaporation of which Apiol is left.

CHARACTERS.—A colorless liquid resembling a fixed oil, but not saponifiable, becoming turbid without congealing at —12° C.; 10.4° F., having an acid reaction, the odor of parsley, and a pungent taste. Sp. gr., 1.070. *Solubility.*—Easily in Alcohol, Ether, Chloroform, and Glacial Acetic Acid.

Dose, .60 to 1.00 c.c.; 10 to 15 ♏ (in capsules).

ACTION.

It is a cerebral and circulatory stimulant.

Uses.

Amenorrhœa, scanty menstruation, and dysmenorrhœa, when these conditions are due to a want of ovarian activity.

Class V of the Volatile Oils also act on the Female Genital Organs.

GROUP VIII.—The Vegetable Bitters.

Calumba, Calamus, Gentian, Quassia, Chirata, Serpentaria, Cimicifuga, Taraxacum, Orange Peel, Lemon Peel.

CALUMBA.

CALUMBA. *Synonym.*—Columbo. The dried root of *Jateorhiza palmata* (Lamarck) Miers (Fam. *Menispermaceæ*). *Habitat.*—Eastern Africa; cultivated in some East Indian Islands.

Characters.—In transverse, circular or oval biconcave sections, 2.5 to 5 cm. in diameter and 2 to 12 mm. thick; externally greenish-brown and wrinkled; internally yellowish or grayish-yellow, with a few interrupted circles of fibrovascular bundles, distinctly radiate in the outer portion, with a dark cambium; fracture short, mealy; odor slight; taste slightly aromatic, very bitter.

Composition.—The chief constituents are—(1) *Calumbin*, $C_{21}H_{22}O_7$, a neutral, bitter principle crystallizing in white needles. (2) *Berberine* ($C_{20}H_{17}NO_4$), an alkaloid, giving the yellow color. *See* Berberi and Hydrastis. (3) *Calumbic* acid, $C_{21}H_{22}O_6$. (4) Starch, 33 per cent. No Tannic Acid is present, so Calumba can be prescribed with iron salts.

Incompatibles.—Ammonia, ferric salts, infusion of cinchona or nutgall, lead acetate, mineral acids, silver nitrate, tartar emetic.

Dose, 2 gm. (30 gr.).

Preparations.

1. **Fluidextractum Calumbæ.**—Fluidextract of Calumba. By maceration and percolation in Alcohol and water, and evaporation.

   Dose, 2 c.c. (30 ♏).

2. **Tinctura Calumbæ.**—Tintcure of Calumba. Calumba, 200, by maceration and percolation in Alcohol and water to 1000.

   Dose, 4 c.c. (1 fl. dr.).

Action.

Is slightly antiseptic and disinfectant; increases the flow of saliva and gastric juice, and improves the appetite and digestion. It is a typical simple bitter.

Uses.

Atonic dyspepsia; anæmia and weakness; convalescence from acute diseases. In general, the simple bitters may be said to be most advantageous in debilitated conditions in which the stomach participates in a feebleness of all the various organs.

CALAMUS.

CALAMUS. *Synonym.*—Sweet Flag. The unpeeled, dried rhizome of *Acorus Calamus* Linné (Fam. *Araceæ*). *Habitat.*—Europe and North America, on the banks of streams and ponds.

Characters.—Rhizome 1 to 2 cm. thick, usually in longitudinally split pieces of various lengths; when entire, cylindraceous and somewhat flattened; externally, reddish-brown; somewhat annulate from remnants of leaf-sheaths; upper surface with triangular leaf-scars, the lower surface with circular pitted scars of roots; fracture short, showing numerous oil-cells and scattered fibro-vascular bundles, the latter crowded within the endoderm. It has an aromatic odor, and a pungent, bitter taste. As found in the shops it is generally peeled.

Composition.—The chief constituents are—(1) *Acorin*, $C_{36}H_{60}O_6$, a bitter glucoside, as a syrupy, yellow liquid. (2) Volatile oil, 1 to 2 per cent. (3) *Calamine*, an alkaloid. (4) Choline.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Calami.—Fluidextract of Calamus. By maceration and percolation with Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

Action.

A simple bitter and feeble aromatic.

Uses.

In flatulence; as an adjuvant to purgative medicines.

GENTIANA.

GENTIAN.—The dried rhizome and roots of *Gentiana lutea* Linné (Fam. *Gentianaceæ*). *Habitat.*—Mountains of Central and Southern Europe.

Characters.—In nearly cylindrical pieces or longitudinal slices, of variable length and from 5 to 35 mm. thick: externally yellowish-brown, the rhizome annulate, the roots longitudinally wrinkled; fracture short, but uneven; the bark rather thick, separated from the somewhat spongy, reddish-

yellow or brownish inner portion by a black cambium zone; odor strong, characteristic; taste slightly sweetish and persistently bitter.

COMPOSITION.—The chief constituents are—(1) *Gentiopicrin*, an active, very bitter glucoside, soluble in water and Alcohol. Can be split up into glucose and *Gentiogenin*. (2) *Gentisic Acid*, $C_{14}H_{10}O_5$, in yellow, tasteless needles, united with *Gentiopicrin*. (3) A trace of a volatile oil. (4) Gentianose, a sugar. Gentian contains no Tannic Acid, but cannot be prescribed with iron, because that darkens the coloring matter.

INCOMPATIBLES.—Iron salts, silver nitrate, lead salts.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Extractum Gentianæ.**—Extract of Gentian. By maceration and percolation with water, and evaporation.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

2. **Fluidextractum Gentianæ.**—Fluidextract of Gentian. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

3. **Tinctura Gentianæ Composita.**—Compound Tincture of Gentian. Gentian, 100; Bitter Orange Peel, 40; Cardamom, 10. By maceration and percolation with Alcohol and water to 1000.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

The same as that of calumba and other simple bitters.

USES.

In the same kinds of cases as other drugs of its class, and, on account of its more agreeable flavor, it is perhaps more widely employed than any of the rest. The preparations of gentian make excellent vehicles.

QUASSIA.

QUASSIA.—The wood of *Picrasma excelsa* (Swartz) Planchon (Fam. *Simarubaceæ*), known commercially at *Jamaica Quassia*, or of *Quassia amara* Linné (Fam. *Simarubaceæ*), known commercially as *Surinam Quassia*. *Habitat.*—Jamaica; Dutch Guiana, South America.

CHARACTERS. *Jamaica Quassia.*—Occurring in various forms, usually in chips, raspings, or billets; yellowish-white or pale yellow, and of rather coarse texture; odor slight; taste intensely bitter; medullary rays containing tetragonal prisms or small, arrow-shaped crystals of calcium oxalate. Billets

of Jamaica Quassia are usually 12.5 cm. or more in diameter; in tangential section, the medullary rays are observed to be mostly 3 or 5 rows of cells in width.

Surinam Quassia.—Occurring usually in billets not exceeding 7.5 cm. in diameter; the wood is heavier, harder, and more deeply colored than that of Jamaica Quassia, and the medullary rays in tangential section are observed to be mostly 1 to 2 rows of cells in width.

Resembling Quassia.—Sassafras, but this is aromatic and not bitter.

COMPOSITION.—The chief constituents are—(1) *Quassiin*, $C_{10}H_{12}O_3$, a bitter principle occurring in crystalline rectangular plates. (2) A volatile oil. No Tannic Acid being present, Quassia can be prescribed with iron salts.

Dose, 0.5 gm. (7½ gr.).

Preparations.

1. **Extractum Quassiæ.**—Extract of Quassia. By percolation with Water, evaporation, and the addition of Sugar of Milk.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

2. **Fluidextractum Quassiæ.**—Fluidextract of Quassia. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 0.5 c.c. (8 ♏).

3. **Tinctura Quassiæ.**—Tincture of Quassia. Quassia, 200; by maceration and percolation with Alcohol and Water to 1000.

Dose, 2 c.c. (30 ♏).

ACTION.

It is an aromatic bitter stomachic.

USES.

Dyspeptic conditions; as quassia contains no tannic acid, it may be prescribed with iron preparations. By enema it is used for thread-worms.

CHIRATA.

CHIRATA. *Synonym.*—Chiretta. The dried plant of *Swertia Chirayita* (Roxburgh) Hamilton (Fam. *Gentianaceæ*). *Habitat.*—Mountains of Northern India.

CHARACTERS.—Smooth; root simple, about 7 mm. thick near the crown; stem about 1 m. long, externally yellowish or purplish-brown, cylindrical near the base, quadrangular and lightly winged above, with numerous opposite, ascending branches; wood yellowish, thin, enclosing usually a

large yellowish easily separable pith; leaves opposite, sessile, ovate-lanceolate, entire, five-nerved, about 6 cm. long; flowers numerous, panicled, small, with a four-lobed calyx and corolla; capsule ovoid, acute, one-celled, many-seeded; odor slight; taste intensely bitter. *Resembling Chirata.*—Lobelia, which is not bitter.

COMPOSITION.—The chief constituents are—(1) *Chiratin*, $C_{26}H_{48}O_{15}$, an active, bitter principle, as a yellow, hygroscopic powder. (2) *Ophelic Acid*, $C_{13}H_{20}O_{11}$, with which it is combined. No Tannic Acid is present.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Chiratæ.—Fluidextract of Chirata. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

ACTION.

It is a simple bitter, like calumba.

USES.

The same as those of calumba and gentian, and in India it is given considerably as a substitute for cinchona. It is thought to be especially serviceable in the dyspepsia of gouty subjects.

SERPENTARIA.

SERPENTARIA. *Synonym.*—Virginia Snakeroot. The dried rhizome and roots of *Aristolochia Serpentaria* Linné (Virginia Serpentaria), or of *Aristolochia reticulata* Nuttall (Texas Serpentaria) (Fam. *Aristolochiaceæ*). *Habitat.*—United States, in hilly woods.

CHARACTERS.—*Virginia Serpentaria.*—The rhizome is of oblique growth, about 2 cm. long and about 2 mm. in diameter; externally yellowish-brown, slightly annulate, the upper surface with numerous stem-scars or stem-bases, the lower surface bearing a dense stress of thin, branching roots from 4 to 7 cm. long; fracture short, yellowish-brown; xylem in the roots 5-rayed; odor camphoraceous; taste bitter and aromatic.

Texas Serpentaria.—The rhizome is about twice as large as that of Virginia Serpentaria, of a grayish-brown color, and the roots are fewer, less interlacing, and thicker.

Resembling Serpentaria.—Veratrum, Arnica and Valerian.

COMPOSITION.—The chief constituents are—(1) A bitter principle, *Aristolochine*, in light-yellow needles. (2) A volatile oil, ½ per cent. containing a Terpene, and mainly $C_{15}H_{25}O_2$, Borneol Ether. (3) Resin. (4) Tannic Acid in small quantity.

Dose, 1 gm. (15 gr.).

Serpentaria is contained in Tinctûra Cinchonæ Composita.

Preparations.

1. **Fluidextractum Serpentariæ.**—Fluidextract of Serpentaria. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 1 c.c. (15 ♏).

2. **Tinctura Serpentariæ.**—Tincture of Serpentaria. Serpentaria, 200; by maceration and percolation with Alcohol and Water to 1000.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

An astringent bitter and stimulating expectorant; in large doses it is a gastro-intestinal irritant.

USES.

As a stomachic bitter; in capillary bronchitis and pneumonia. It is seldom given alone.

CIMICIFUGA.

CIMICIFUGA. *Synonyms.*—Black Snakeroot. Black Cohosh. The dried rhizome and roots of *Cimicifuga racemosa* (Linné) Nuttall (Fam. *Ranunculaceæ*). *Habitat.*—North America; in rich woodlands, westward to Eastern Kansas.

CHARACTERS.—Rhizome horizontal in growth, 2 to 15 cm. long, 1 to 2.5 cm. thick, with numerous thick, erect or ascending branches, about 2.5 cm. long, each terminated by a deep, cup-shaped scar; roots numerous, brittle, obtusely quadrangular, and about 2 mm. thick; the whole brownish-black; fracture of rhizome horny, of root, short, the rhizome exhibiting a rather large pith, surrounded by numerous whitish, radially sublinear xylem plates; bark thin, firm; the roots having a thick bark and usually a four-rayed wood; odor slight but heavy; taste bitter and acrid.

COMPOSITION.—The chief constituents are—(1) An acrid, crystalline principle, soluble in Chloroform and Alcohol. (2) Tannic and Gallic Acids. (3) Two Resins. *Cimicifugin* or *Macrotin* is an impure resin deposited from the tincture on adding water.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Extractum Cimicifugæ.**—Extract of Cimicifuga. By evaporation of the Fluidextract and the addition of powdered Glycyrrhiza (peeled, Russian).

Dose, 0.250 gm. = 250 milligm. (4 gr.).

2. Fluidextractum Cimicifugæ.—Fluidextract of Cimicifuga. By maceration and percolation with Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

3. Tinctura Cimicifugæ.—Tincture of Cimicifuga. Cimicifuga, 200; by maceration and percolation with Alcohol to 1000.

Dose, 4 c.c. (1 fl. dr.).

Action.

It is bitter, and a mild cardiac stimulant; it is said to cause uterine contractions.

Uses.

It has been used in a number of affections, and especially chorea, but any benefit derived from it is probably to be attributed merely to its action as a simple bitter.

TARAXACUM.

TARAXACUM. *Synonym.*—Dandelion. The dried root of *Taraxacum officinale* Weber (Syn. *Taraxacum Taraxacum* (Linné) Karsten) (Fam. *Compositæ*), collected in autumn. *Habitat.*—Grassy places and roadsides in Europe; naturalized in the United States.

Characters.—Cylindraceous and tapering very gradually, of variable length and 1 to 2 cm. thick above, crowned with several short, thickish heads, usually simple or somewhat branched; externally blackish-brown, longitudinally wrinkled; fracture short, showing a yellowish, porous central axis, surrounded by a thick, whitish bark, containing numerous milk vessels arranged in concentric circles; inodorous; bitter. *Resembling Taraxacum.*—Pellitory, which is pungent when chewed.

Composition.—The chief constituents are—(1) *Taraxacin*, a crystalline bitter principle, soluble in water and Alcohol. (2) *Taraxacerin*, $C_8H_{16}O$. (3) Asparagin (found in asparagus, marsh-mallow, licorice, euonymus) of no therapeutic value. (4) Inulin. (5) Resin (which gives the juice its milky appearance).

Impurity.—The root of the *Chicorium Intybus*, which is paler, and has the milk vessels in radiating lines.

Dose, 8 gm. (120 gr.).

Preparations.

1. Extractum Taraxaci.—Extract of Taraxacum. By percolation and maceration with Alcohol and water, and evaporation.

Dose, 1 gm. (15 gr.).

2. Fluidextractum Taraxaci.—Fluidextract of Taraxacum. Taraxacum, 1000 gm. By maceration and percolation with diluted Alcohol, evaporation, and the addition of solution of Sodium Hydroxide, 50 c.c., and sufficient Diluted Alcohol to make 1000 c.c.

Dose, 8 c.c. (2 fl. dr.).

ACTION.

Stomachic; mildly laxative and diuretic.

USES.

Dyspepsia; catarrhal jaundice; ascites from hepatic disease; it is not prescribed nearly so frequently as formerly.

AURANTIUS.

AURANTII AMARI CORTEX.—Bitter Orange Peel. The dried rind of the unripe fruit of *Citrus vulgaris* Risso (Fam. *Rutaceæ*). *Habitat.*—Northern India; cultivated in subtropical countries.

CHARACTERS.—In narrow, thin bands, or in quarters; epidermis of a dark, brownish-green color, outer layer with numerous oil reservoirs; inner layer spongy, light yellowish-brown; odor fragrant; taste aromatic and bitter.

COMPOSITION.—The chief constituents are—(1) A volatile oil, consisting mainly of *Hesperidene*, $C_{10}H_{16}$, with a small portion of *Geraniol*, $C_{10}H_{16}O$. (2) Three glucosides, *Hesperidin*, *Isohesperidin* and *Aurantiamarin*, the bitter principle. Both Bitter and Sweet Orange Peel contain a substance which reacts with iron salts and Tannic Acid.

Dose, 1 gm. (15 gr.).

Bitter Orange Peel is used in preparing Tinctura Cinchonæ Composita and Tinctura Gentianæ Composita.

Preparations.

1. Fluidextractum Aurantii Amari.—Fluidextract of Bitter Orange Peel. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 1 c.c. (15 ♏).

2. Tinctura Aurantii Amari.—Tincture of Bitter Orange Peel. Bitter Orange Peel, 200. By maceration and percolation with Alcohol and water to 1000.

Dose, 4 c.c. (1 fl. dr.).

AURANTII DULCIS CORTEX.—Sweet Orange Peel. The recently separated outer rind of the ripe fruit of *Citrus Aurantium* Linné (Fam. *Rutaceæ*). *Habitat.*—As of the *Citrus vulgaris*.

CHARACTERS.—Outer surface orange-yellow, with numerous oil reservoirs; odor highly fragrant; taste pungently aromatic.

COMPOSITION.—As of the Bitter Orange Peel.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Syrupus Aurantii.**—Syrup of Orange. Tincture of Sweet Orange Peel, 50; Critic Acid, 5; Magnesium Carbonate, 10; Sugar, 820; Water to 1000.

2. **Tinctura Aurantii Dulcis.**—Tincture of Sweet Orange Peel. Sweet Orange Peel, 500. By maceration and percolation with Alcohol to 1000.

Dose, 4 c.c. (1 fl. dr.).

Tincture of Sweet Orange Peel is contained in Vinum Ferri and Vinum Ferri Amarum.

OLEUM AURANTII CORTICIS.—Oil of Orange Peel. A volatile oil obtained by expression from the fresh peel of the Sweet Orange. It should be kept in small, well-stoppered, amber-colored bottles, in a cool place, in order to avoid the development of a terebinthinate odor.

CHARACTERS.—A pale, yellow liquid, having the characteristic, aromatic odor of Orange, and an aromatic taste. Sp. gr., 0.842 to 0.846.

IMPURITIES.—Oil of Turpentine, etc.

Dose, 0.2 c.c. (3 ♏).

Preparations.

1. **Elixir Aromaticum.**—Aromatic Elixir. Compound Spirit of Orange, 12; Syrup, 375; Purified Talc, 30; Alcohol, Distilled Water, each, a sufficient quantity to make 1000. By solution of the Compound Spirit of Orange in Alcohol, to 250; addition of Syrup and Purified Talc, and filtering, with Distilled Water to 1000.

Aromatic Elixir is used in Elixir Adjuvans and Liquor Ferri et Ammonii Acetatis.

2. **Spiritus Aurantii Compositus.**—Compound Spirit of Orange. Oil of Orange Peel, 200; Oil of Lemon, 50; Oil of Coriander, 20; Oil of Anise, 5; Alcohol to 1000.

Compound Spirit of Orange is contained in Fluidextractum Rhamni Purshianæ Aromaticum.

Preparations of the Volatile Oil of Fresh Orange Flowers.

1. **Aqua Aurantii Florum.**—Orange Flower Water. Stronger Orange Flower Water, Distilled Water, each, one volume.

Dose, 16 c.c. (4 fl. dr.).

Orange Flower Water is contained in Syrupus Amygdalæ, Syrupus Calcii Lactophosphatis, and Syrupus Lactucarii.

2. Aqua Aurantii Florum Fortior.—Stronger Orange Flower Water. *Synonym.*—Triple Orange Flower Water. Water saturated with the volatile oil of fresh Orange Flowers obtained as a by-product in the distillation of the Oil of Orange Flowers. It should be kept in bottles loosely stoppered with a pledget of purified cotton, and in a dark place.

IMPURITY.—Metallic matters.

Dose, 8 c.c. (2 fl. dr.).

Stronger Orange Flower Water is used in several Trochisci.

3. Syrupus Aurantii Florum.—Syrup of Orange Flowers. Sugar, 850; Orange Flower Water to 1000.

ACTION.

Aromatic; stomachic; tonic. The oil has the action of other volatile oils; in large amounts it is a gastro-intestinal irritant and may give rise to convulsions.

USES.

For flavoring purposes and as a vehicle.

LIMON.

LIMONIS CORTEX.—Lemon Peel. The recently separated outer rind of the ripe fruit of *Citrus Limonum* Risso (Fam. *Rutaceæ*). *Habitat.*—Northern India; cultivated in subtropical countries.

CHARACTERS.—Outer surface lemon-yellow, the tissue beneath containing numerous large oil reservoirs; odor highly fragrant; taste pungently aromatic.

COMPOSITION.—The chief constituents are—(1) the official oil, $C_{10}H_{16}$ (*see* below). (2) *Hesperidin*, $C_{22}H_{26}O_{12}$, a bitter principle.

Preparation.

Tinctura Limonis Corticis.—Tincture of Lemon Peel. Lemon Peel, 500; Alcohol, to 1000. By maceration and filtration.

INCOMPATIBLES.—Acacia, aqueous fluids, gelatin.

Tincture of Lemon Peel is contained in Syrupus Acidi Citrici.

OLEUM LIMONIS.—Oil of Lemon. A volatile oil obtained by expression from fresh Lemon Peel, yielding, when assayed, not less than 4 per cent. of Aldehyde, calculated as Citral.

CHARACTERS.—A pale yellow, limpid liquid, having the fragrant odor of lemon, and an aromatic, somewhat bitter taste. Sp. gr., 0.851 to 0.855.

COMPOSITION.—The chief constituents are—(1) A terpene called *Citrene*, or *Limonene*, $C_{10}H_{16}$, 90 per cent., strongly dextro-rotary. This is also fouud in Orange Peel and Oil of Caraway. (2) *Geranial* or *Citral*, $C_{10}H_{16}O$, an aldehyde derived from Geraniol found in Oil of Rose (*see* p. 382). (3) Citronellal, an aldehyde of the alcohol, Citronellol.

Dose, 0.2 c.c. (3 ♏).

Oil of Lemon is contained in Spiritus Ammoniæ Aromaticus and Spiritus Aurantii Compositus.

ACTION.

The same as that of Orange.

USES.

Principally for flavoring purposes.

LIMONIS SUCCUS.—Lemon Juice. The freshly expressed juice of the ripe fruit of *Citrus Limonum* Risso (Fam. *Rutaceæ*).

CHARACTERS.—A slightly turbid, yellowish liquid, having the odor of Lemon. Taste acid, and often slightly bitter. Sp. gr., 1.030 to 1.040.

COMPOSITION.—Lemon juice contains—(1) *Citric Acid* ($H_3C_6H_5O_7 + H_2O$), about 7 per cent., both free, and combined to form Potassium and other salts. (2) Malic Acid. (3) Phosphoric Acid.

Dose, 30 c.c. (1 fl. oz.).

ACTION.

The same as Citric Acid.

USES.

In beverages for the sick; its most important medicinal use is in the prophylaxis and treatment of scurvy.

GROUP IX.—Drugs Containing Tannic Acid.

White Oak, Nutgall, Tannic Acid, Gallic Acid, Pyrogallol, Gambir, Krameria, Kino, Hematoxylon, Hamamelis, Rhus Glabra, Geranium, Rubus.

QUERCUS.—White Oak. The dried bark of the *Quercus alba* Linné (Fam. *Cupuliferæ*), collected from trunks or branches ten to twenty-five years of age, and deprived of the periderm. *Habitat.*—North America, westward to Minnesota, Kansas, and Mississippi; in woods.

CHARACTERS.—In nearly flat pieces, 2 to 10 mm. thick; externally light brown, becoming darker with age, rough-fibrous; fracture uneven, coarsely fibrous; odor distinct; taste strongly astringent; not tingeing the saliva yellow when chewed.

COMPOSITION.—The chief constituents are—(1) *Quercitannic acid*, $C_{28}H_{24}O_{12}$, 6 to 11 per cent., a variety of Tannic Acid. (2) *Quercin*, a bitter principle. (3) *Quercite*, a sugar. (4) Resin.

INCOMPATIBLES.—*See* Tannic Acid, below.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Quercus.—Fluidextract of Quercus. By maceration and percolation with Glycerin and Diluted Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

GALLA.—Nutgall. An excrescence on *Quercus infectoria* Olivier (Fam. *Cupuliferæ*), caused by the punctures and deposited ova of *Cynips tinctoria* Olivier. *Habitat.*—Levant.

CHARACTERS.—Subglobular, 1 to 2 cm. in diameter, externally blackish olive-green or blackish-gray, more or less tuberculated above, the basal portion nearly smooth and contracted into a short stalk, sometimes with a perforation on one side; heavy; fracture horny, yellowish or grayish; in the centre a cavity containing either the partly developed insect, or pulverulent remains left by it; nearly inodorous; taste strongly astringent.

COMPOSITION.—The chief constituents are—(1) *Tannic Acid*, 50 to 60 per cent. (2) *Gallic Acid*, 2 to 3 per cent. (3) Sugar. (4) Resin.

INCOMPATIBLES.—*See* Tannic and Gallic Acids.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparations.

1. **Tinctura Gallæ.**—Tincture of Nutgall. Nutgall, 200; by maceration with Glycerin, 100, and Alcohol to 1000.

Dose, 4 c.c. (1 fl. dr.).

2. **Unguentum Gallæ.**—Nutgall Ointment. Nutgall, 20; Ointment, 80.

ACIDUM TANNICUM.—Tannic Acid. $HC_{14}H_9O_9 = 319.66$. *Synonyms.*—Tannin. Gallotannic Acid. Digallic Acid. A monobasic organic acid ($C_{13}H_9O_7 \cdot COOH$), obtained from Nutgall.

SOURCE.—(1) Expose powdered Nutgall to a damp atmosphere for twenty-four hours. (2) Add Ether to form a paste, and let it stand, closely covered, for six hours. (3) Express this in a close canvas cloth, between tinned plates, reduce the resulting cake to powder and mix with sufficient

Ether and express as before. (4) Mix the expressed liquids and allow the mixture to evaporate spontaneously. Tannic Acid remains. $2HC_7H_5O_5 - H_2O = HC_{14}H_9O_9$.

CHARACTERS.—A light yellowish, amorphous powder, gradually turning darker when exposed to air and light, usually cohering in the form of glistening scales or spongy masses; odorless, or having a faint, characteristic odor, and a strongly astringent taste. *Solubility.*—Very soluble in water, Alcohol; boiling water, and boiling Alcohol; also in about 1 part of Glycerin, with the application of a moderate heat; freely soluble in Diluted Alcohol, sparingly in Absolute Alcohol; almost insoluble in absolute Ether, Chloroform, Benzene or Petroleum Benzin.

IMPURITIES.—Gallic acid, gum, dextrin, resinous substances.

INCOMPATIBLES.—Mineral acids, albumin, alkaloids, amyl nitrite, antipyrine, arsenic, salts of antimony, chromium, copper, iron, lead, mercury and silver, emulsions, gelatin, iodine, iodoform, lime-water, starch, spirit of nitrous ether, chlorates, permanganates and other oxidizers.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparations.

1. **Collodium Stypticum.**—Styptic Collodion. Tannic Acid, 20; Alcohol, 5; Ether, 25; Collodion, to 100. By solution.

2. **Glyceritum Acidi Tannici.**—Glycerite of Tannic Acid. Tannic Acid, 20; Glycerin, 80.

Dose, 2 c.c. (30 ♏).

3. **Trochisci Acidi Tannici.**—Troches of Tannic Acid. Tannic Acid, 6; Sugar, 65; Tragacanth, 2 gm.; Stronger Orange Flower Water, a sufficient quantity to make 100 troches. Each troche contains about .06 gm.; 1 gr., of Tannic Acid.

4. **Unguentum Acidi Tannici.**—Ointment of Tannic Acid. Tannic Acid, 20; Glycerin, 20; Ointment, 60.

ACTION.

Astringent and hæmostatic; the characteristic effect is the precipitation of albumins and other proteids, as well as gelatin and many alkaloids and glucosides. In the intestine the greater part of the tannic acid is converted into gallic acid.

USES.

To control bleeding in various parts of the body, as the nose, throat, stomach or intestine; as an astringent for hæmorrhoids, ulcers, sores, moist eruptions, tonsillitis, nasal catarrh, otorrhœa,

diarrhœa, dysentery, and various other conditions; as an antidote in poisoning with metallic compounds, such as tartar emetic, and with alkaloids.

ACIDUM GALLICUM.—Gallic Acid. $HC_7H_5O_5 + H_2O = 186.65$. An organic acid [$C_6H_2(OH)_3COOH + H_2O$], usually prepared from Tannic Acid.

SOURCE.—Boil 1 part of Tannic Acid (or 2 parts of coarsely powdered Nutgall) with 1 part of Sulphuric Acid and 5 parts of water, for 15 minutes; strain the mixture while hot, and set the liquid aside so that crystals may form; these are then deprived of color by resolution in water and filtration through animal charcoal. The filtrate is set aside again to crystallize, and if necessary, the treatment with charcoal is repeated.

CHARACTERS.—White, or pale fawn-colored, silky, interlaced needles, or triclinic prisms; odorless; having an astringent and slightly acidulous taste; permanent in the air. *Solubility.*—In from 83 to 86 parts of water, and 3 of boiling water; in 4.14 parts of Alcohol, and 1 part of boiling Alcohol; also in 40 parts of Ether, and in 12 parts of Glycerin. Very slightly soluble in Chloroform, Benzene, or Petroleum Benzin.

IMPURITY.—Tannic Acid.

INCOMPATIBLES.—Ferric and metallic salts generally, iodine, lime-water, opium in solution, spirit of nitrous ether.

Dose, 1 gm. (15 gr.).

ACTION.

It does not precipitate albumin, and therefore has no local styptic or astringent effects, its action being apparently simply that of a weak organic acid.

USES.

To produce the supposed remote astringent effects of tannic acid.

PYROGALLOL.

PYROGALLOL.—$C_6H_6O_3 = 125.10$. *Synonym.*—Pyrogallic Acid. It should be kept in dark, amber-colored bottles.

SOURCE.—A triatomic phenol [$C_6H_3(OH)_3 \cdot 1:2:3$], obtained chiefly by carefully heating Gallic Acid. $HC_7H_5O_5 = C_6H_3(OH)_3 + CO_2$.

CHARACTERS.—Light white laminæ, or fine needles, odorless, and having a bitter taste; acquiring a grayish tint on exposure to air and light. *Solubility.*—In 1.6 parts of water, in 1 part of Alcohol, and in 1.1 parts of Ether; very soluble in boiling water and in boiling Alcohol.

ACTION.

Irritant; antiseptic; stains the skin and clothing.

USES.

Parasitic and other diseases of the skin; it should not be applied over too large a surface, as absorption may cause serious or fatal poisoning.

Unofficial Preparations.

Tanalbinum.—Tanalbin. *Synonym.*—Tannin Albuminate.

SOURCE.—Obtained by adding to 10 parts of a 10 per cent. solution of Albumin 6½ parts of a 10 per cent. solution of Tannin; the precipitate is collected, washed, pressed and dried by exposure to heat for six hours.

CHARACTERS.—A light brown powder, insoluble in water and in the gastric juice, tasteless, odorless and non-irritant to mucous membranes. It contains about one-half its weight of tannic acid.

Dose, .30 gm. (5 gr.).

ACTION.

Feebly astringent. It is probably decomposed in the intestine.

USES.

Gastric and intestinal catarrh; chronic diarrhœa, chronic albuminuria.

Tannigenum.—Tannigen. $C_{14}H_8(COCH_3)_2O_9$. *Synonyms.*—Diacetyl Tannic Acid. Acetic Ester of Tannic Acid.

SOURCE.—Obtained by the action of Acetic Anhydride or Acetyl Chloride upon Tannin.

CHARACTERS.—A yellowish-gray, tasteless, odorless and slightly hygroscopic powder. *Solubility.*—Insoluble in cold water, soluble in dilute solution of Sodium Phosphate, Soda or Borax, and readily soluble in Alcohol.

Dose, .30 to 2.00 gm.; 5 to 30 gr.

ACTION.

Astringent.

USES.

Chronic diarrhœa, especially that accompanying phthisis; locally by insufflation in rhinitis and laryngitis.

GAMBIR.

GAMBIR. An extract prepared from the leaves and twigs of *Ourouparia Gambir* (Hunter) Baillon (Fam. *Rubiaceæ*). Gambir has taken the place of Catechu, an extract prepared from the wood of *Acacia Catechu* (Fam. *Leguminosæ*), which was formerly employed for the same purposes. *Habitat.*—Eastern Asia, Malay Archipelago.

CHARACTERS.—Irregular masses, or cubes about 25 mm. in diameter; externally reddish-brown, pale brownish-gray, or light brown; fracture dull-earthy, friable, crystalline; inodorous, bitterish, very astringent, with a sweetish after-taste; free from starch.

COMPOSITION.—The chief constituents are—(1) *Catechutannic Acid*, 36 to 40 per cent., the active principle, isomeric with *Catechin*, and converted into it by boiling or by the saliva, a red color being formed. (2) *Catechin* or *Catechuic Acid*, $C_{21}H_{20}O_9 + 5H_2O$, probably inactive. Both constituents give a green precipitate with Ferric Salts. (3) Pyrocatechin or catechol, $C_6H_4(OH)_2$, which gives a green color with ferric chloride. These substances are also found in Catechu, but Gambir usually yields more Catechin and less Catechutannic Acid than Catechu.

INCOMPATIBLES.—Alkalies, metallic salts, gelatin.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Tinctura Gambir Composita.**—Compound Tincture of Gambir. Gambir, 50; Saigon Cinnamon, 25; by maceration and percolation with diluted Alcohol, to 1000.

   Dose, 4 c.c. (1 fl. dr.).

2. **Trochisci Gambir.**—Troches of Gambir. Gambir, 6; Sugar, 65; Tragacanth, 2 gm.; Stronger Orange Flower Water, a sufficient quantity to make 100 troches. Each troche contains about .06 gm. (1 gr.).

ACTION.

Powerfully astringent.

USES.

Locally in relaxed conditions of the throat or vagina, spongy gums, epistaxis, etc.; internally in diarrhœal diseases and in hæmoptysis and other hæmorrhages.

KRAMERIA.

KRAMERIA. *Synonym.*—Rhatany. The dried root of *Krameria triandra* Ruiz and Pavon (Peruvian Krameria), *Krameria Ixina* Linné (Savanilla Krameria), or of *Krameria argentea* Martius (Para or Bra-

zilian Krameria) (Fam. *Krameriaceæ*). *Habitat.*—Peru, Bolivia, Brazil and United States of Colombia.

CHARACTERS. *Peruvian Krameria.*—Root-branches several or many, usually occurring with several or many attached to a short, hard, and woody tap-root, which is 1.5 to 4 cm, thick, roughly fissured, and supports a knotty, several- to many-headed crown of variable length, rarely exceeding 50 cm. and usually less than 1 cm. thick, cylindrical, flexuous or wavy, very flexible; externally light red-brown, more or less marked with dark, scaly patches, especially upward, otherwise smoothish, devoid of transverse fissures; fracture tough and splintery, the pinkish-brown bark occupying less than one-third of the radius, the wood yellowish or pinkish-white, finely radiate; inodorous and of a very astringent taste.

Savanilla and Brazilian Kramerias.—Branches usually occurring detached from the tap-root and crown, less flexuous than those last described, externally of a purple-brown or chocolate brown, and with numerous transverse cracks or fissures; fracture less tough than that of Peruvian Krameria, the bark and wood both darker, the bark occupying two-fifths or more of the radius, the taste more astringent than that of Peruvian Krameria.

COMPOSITION.—The chief constituents are—(1) *Kramerotannic Acid*, $C_{54}H_{24}O_{21}$, 20 per cent. (2) *Rhatanin.* (3) Rhatanic red, $C_{26}H_{22}O_{11}$, the coloring matter.

INCOMPATIBLES.—Alkalies, lime water, iron and lead salts, gelatin.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Extractum Krameriæ.**—Extract of Krameria. By percolation with water, straining and evaporation.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

2. **Fluidextractum Krameriæ.**—Fluidextract of Krameria. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

3. **Syrupus Krameriæ.**—Syrup of Krameria. Fluidextract of Krameria, 450; Syrup, 550.

Dose, 4 c.c. (1 fl. dr.).

4. **Tinctura Krameriæ.**—Tincture of Krameria. Krameria, 200; by maceration and percolation with Diluted Alcohol to 1000.

Dose, 4 c.c. (1 fl. dr.).

5. **Trochisci Krameriæ.**—Troches of Krameria. Extract of Krameria, 6; Sugar, 65; Tragacanth, 2; Stronger Orange Flower Water, a sufficient quantity to make 100 troches. Each troche contains about .06 gm. (1 gr.).

ACTION.

Powerfully astringent; in small doses it is slightly tonic.

USES.

Locally, bleeding from the nose, rectum and other accessible parts, relaxed conditions of the throat, etc.; also dysentery and fissure of the anus; sponginess of the gums, leucorrhœa, gonorrhœa and gleet. Internally, diarrhœa; gastric and intestinal hæmorrhage; incontinence of urine from debility of the urinary organs.

KINO.

KINO.—The inspissated juice of *Pterocarpus Marsupium* Roxburgh (Fam. *Leguminosæ*). *Habitat.*—East Indies.

CHARACTERS.—Small, angular, dark red, shining pieces, brittle, in thin layers ruby red and transparent; inodorous, very astringent, and sweetish, tingeing the saliva deep-red. *Solubility.*—Soluble in Alcohol; nearly insoluble in Ether; slowly soluble in cold water.

COMPOSITION.—The chief constituents are—(1) *Kinotannic Acid*, $C_{18}H_{18}O_8$, 75 per cent. (2) *Kinoin*, a crystalline neutral principle. (3) *Pyrocatechin*, $C_6H_4(OH_2)$, a substance also found pathologically in the urine, and giving it a dark color. It reduces blue copper solutions. (4) Kino red, formed from kinotannic acid by oxidation. (5) Gum.

INCOMPATIBLES.—Mineral acids, alkalies, all metallic salts, carbonates, gelatin.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparation.

Tinctura Kino.—Tincture of Kino. Kino, 50; Purified Talc, 10; Glycerin, 150; Alcohol, 650; Water to 1000. By trituration, heating and filtration.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

Powerfully astringent.

USES.

Internally, diarrhœa, pyrosis; locally, epistaxis, indolent ulcers, gonorrhœa, and as a gargle.

HÆMATOXYLON.

HEMATOXYLON. *Synonym.*—Logwood. The heart-wood of *Hæmatoxylon campechianum* Linné (Fam. *Leguminosæ*). *Habitat.*—Central America; naturalized in the West Indies.

CHARACTERS.—Usually in small chips, reddish-brown, the freshly cut surface dark yellowish-red; on transverse section the wood shows medullary rays which are four cells wide; odor faint, agreeable; taste sweetish, astringent. Hematoxylon imparts to water containing a little acid a yellowish color, which is changed to purple or violet-red by alkalies. When chewed, it colors the saliva dark pink. When the surface has a greenish metallic lustre, the wood has undergone fermentation and should be rejected. *Resembling Logwood.*—Red Saunders, which is more dense and less astringent.

COMPOSITION.—The chief constituents are—(1) *Tannic Acid.* (2) *Hæmatoxylin*, $C_{16}H_{14}O_6$, 12 per cent. Occurring in sweet, colorless crystals, which become dark-red on exposure to light. Solutions of it are used to stain histological specimens. (3) *Hæmatein*, $C_{16}H_{12}O_6$, a product of oxidation of the former, having a green, metallic lustre.

INCOMPATIBLES.—Mineral acids, lime water, ammonia, alum, infusion of cinchona, opium, tartar emetic; metallic salts give a blue color.

Preparation.

Extractum Hæmatoxyli.—Extract of Hematoxylin. By maceration in Water, boiling, straining and evaporation.
Dose, 1 gm. (15 gr.).

ACTION.

Astringent; tonic; feebly antiseptic.

USES.

Internally, diarrhœa; locally, gangrenous and ill-conditioned sores, leucorrhœa, bleeding piles, etc.

HAMAMELIS.

1. **HAMAMELIDIS CORTEX.**—Hamamelis Bark. *Synonym.*—Witchhazel Bark. The bark and twigs of *Hamamelis virginiana* Linné (Fam. *Hamamelidaceæ*).

CHARACTERS.—In irregularly quilled or bent pieces, 1 to 2 mm. thick; outer surface grayish-brown, with numerous lenticels, or reddish-brown, with short transverse ridges or scars, or somewhat scaly in older bark; the thin, corky layer easily removed from the pale cinnamon-colored middle bark; inner surface pale cinnamon-colored, or sometimes yellowish, smooth, or finely striate; fracture of young bark short, of old tough in the bast layer; odor faint; taste astringent, somewhat bitter and pungent. Twigs flexible and tough, of irregular length, not more than 6 mm. in diameter, branching, or bearing nodes at intervals of 2 to 5 cm.; externally varying from yellowish-brown to deep purplish-brown, lightly longitudinally wrinkled, and having scattered small circular whitish or pale lenticels; bark occupying

about one-fifth of the radius; wood greenish-white, lightly radiate, and exhibiting one to three annual rings; pith centric, small.

Dose, 2 gm. (30 gr.).

Preparation.

Aqua Hamamelidis.—Hamamelis Water. From Hamamelis Bark by maceration and distillation with water and Alcohol.

IMPURITY.—Formaldehyde.

Dose, 8 c.c. (2 fl. dr.).

2. HAMAMELIDIS FOLIA.—Hamamelis Leaves. *Synonym.*—Witch-hazel Leaves. The leaves of *Hamamelis virginiana* Linné (Fam. *Hamamelidaceæ*), collected in autumn. *Habitat.*—North America, in thickets.

CHARACTERS.—Short-petiolate; blade inequilaterally obovate or oval, about 10 cm. long; base slightly heart-shaped and oblique, margin coarsely sinuate; upper surface pale or brownish-green; under surface light green, with a satiny lustre, the midrib and veins prominent, the few hairs having much thickened walls and a very small lumen; petiole short, stout; odor slight; taste astringent, slightly aromatic and bitter.

COMPOSITION.—The chief constituents are—(1) *Tannic Acid*, 8 per cent. (2) A bitter principle not yet isolated. (3) A volatile oil (in minute amount), about which little is known. (4) Resin.

Preparation.

Fluidextractum Hamamelidis Foliorum.—Fluidextract of Hamamelis Leaves. By maceration and percolation with Glycerin, Alcohol and water, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Astringent; hæmostatic.

USES.

Locally, sprains, bruises and superficial inflammations; pharyngitis; nasal catarrh; inflammation or hæmorrhage of the bladder; epistaxis; spongy gums; bleeding piles; fissure of the anus; hyperidrosis; burns; acne and other skin diseases. Internally, diarrhœal affections.

RHUS GLABRA.

RHUS GLABRA. *Synonym.*—Sumach. The dried fruit of *Rhus glabra* Linné (Fam. *Anacardiaceæ*). *Habitat.*—North America, west to Colorado and Idaho; in barren soil.

CHARACTERS.—Flattened-ovoid, 3 to 4 cm. in diameter, externally deep crimson, glandular-tomentose; endocarp smooth, shiny, enclosing a single seed; inodorous; taste acidulous and astringent.

COMPOSITION.—The chief constituents are—(1) *Tannic Acid*, of which it contains from 6 to 27 per cent. (2) *Gallic Acid*. (3) Acid calcium and potassium malates. (4) A red coloring matter.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Rhois Glabræ.—Fluidextract of Rhus Glabra. By maceration and percolation with Glycerin and Diluted Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

ACTION.

Astringent; refrigerant.

USES.

Locally, aphthæ and other forms of stomatitis; pharyngitis; wounds and ulcers. Internally, mild catarrhal affections of the stomach and bowels.

GERANIUM.

GERANIUM. *Synonym.*—Cranesbill. The dried rhizome of *Geranium maculatum* Linné (Fam. *Geraniaceæ*). *Habitat.*—North America, in woods and thickets.

CHARACTERS.—Of horizontal growth, cylindraceous, somewhat flattened and rather sharply tuberculated, 2.5 to 10 cm. long; 3 to 15 mm. thick; longitudinally wrinkled, dark brown; fracture short, pale reddish-brown or purplish; bark thin; wood indistinct; central pith large; odor slight; taste strongly astringent.

COMPOSITION.—(1) *Tannic Acid*, 12 to 17 per cent. (2) *Gallic Acid*. (3) Pectin.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Geranii.—Fluidextract of Geranium. By maceration and percolation with Glycerin, Alcohol and water, evaporation.

Dose, 1 c.c. (15 ♏).

ACTION.

Astringent; tonic.

USES.

Diarrhœa; dysentery; hæmorrhages.

RUBUS.

RUBUS. *Synonym.*—Blackberry. The dried bark of the rhizome of *Rubus villosus* Aiton, *Rubus nigrobaccus* Bailey, or of *Rubus cuneifolius* Pursh (Fam. *Rosaceæ*). *Habitat.*—North America, in fields and thickets.

CHARACTERS.—In elongated, tough, flexible quills, from 3 to 6 mm. in diameter, or in similar bands, bark 1 to 2 mm. thick; outer surface deep red-brown or dark gray-brown, occasionally blackish-brown, smoothish or somewhat scaly; inner surface yellow or pale brownish, strongly and coarsely long straight-striate; fracture tough-fibrous; readily splitting; inodorous; taste strongly astringent and bitterish.

COMPOSITION.—(1) *Tannic Acid*, 10 to 13 per cent. (2) *Gallic Acid*, 0.4 per cent. (3) *Villosin*, a bitter crystalline glucoside, soluble in Alcohol.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Fluidextractum Rubi.**—Fluidextract of Rubus. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

2. **Syrupus Rubi.**—Syrup of Rubus. Fluidextract of Rubus, 250; Syrup, 750.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

Slightly astringent.

USES.

Diarrhœa.

GROUP X.—Volatile Oils and Substances Containing Them.

CLASS I.—ACTING CHIEFLY ON THE CENTRAL NERVOUS SYSTEM AND HEART.

Valerian, Cypripedium, Asafetida, Sumbul, Myrrh.

VALERIANA.

VALERIAN.—The dried rhizome and roots of *Valeriana officinalis* Linné (Fam. *Valerianaceæ*). *Habitat.*—Europe and Northern Asia; naturalized in England; cultivated.

CHARACTERS.—Rhizome from 2 to 4 cm. long, and 1 to 2 cm. thick, upright, subglobular or obconical, truncate at both ends, brown or yellowish-brown, internally whitish or pale brownish, with a narrow circle of white wood under the thin bark; roots numerous, slender, brittle, brown with a thick bark, and slender, ligneous cord; odor peculiar, becoming stronger

and unpleasant on keeping the drug; taste camphoraceous and somewhat bitter. *Resembling Valerian.*—Serpentaria, Arnica, Green Hellebore; but Valerian is known by its odor.

COMPOSITION.—The chief constituents are—(1) *A volatile oil*, ½ to 2 per cent., consisting of *Borneol*, $C_{10}H_{18}O$, and *Pinene*, a terpene (*see* p. 390). (2) *Valeric Acid*, $C_5H_{10}O_2$. It is colorless, oily, with the odor of Valerian, and strongly acid, with a burning taste. *Solubility.*—In 30 parts of water; readily in Alcohol and Ether. The amount of it in Valerian increases by keeping, while that of the oil decreases. It can be derived from Amylic Alcohol, $C_5H_{12}O$ (Valeryl Aldehyde). (3) Formic, Acetic and Malic Acids. (4) Tannic acid. (5) Resin.

Dose, 2 gm. (30 gr.).

Preparations.

1. **Fluidextractum Valerianæ.** — Fluidextract of Valerian. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 2 c.c. (30 ♏).

2. **Tinctura Valerianæ.** — Tincture of Valerian. Valerian, 200; by maceration and percolation with Alcohol and Water to 1000.

Dose, 4 c.c. (1 fl. dr.).

3. **Tinctura Valerianæ Ammoniata.**—Ammoniated Tincture of Valerian. Valerian, 200; by maceration and percolation with Aromatic Spirit of Ammonia to 1000.

Dose, 2 c.c. (30 ♏).

AMMONII VALERAS.—Ammonium Valerate. $NH_4C_5H_9O_2 = 118.24$. It should contain not less than 98 per cent. of pure Ammonium Valerate, $C_4H_9COONH_4$.

SOURCE.—By saturating Valeric Acid with Gaseous Ammonia, obtained from a mixture of Ammonium Chloride and Lime, and crystallization.

CHARACTERS.—Colorless, or white, quadrangular plates, emitting the odor of Valeric Acid, of a sharp and sweetish taste, and deliquescent in moist air. *Solubility.*—Very soluble in water and in Alcohol; also soluble in Ether.

IMPURITIES.—Ammonium acetate, heavy metals.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

ZINCI VALERAS.—Zinc Valerate. $Zn(C_5H_9O_2)_2 + 2H_2O = 301.28$. It should contain not less than 99 per cent. of pure Zinc Valerate, $(C_4H_9 \cdot COO)_2Zn + 2H_2O$.

SOURCE.—From hot solutions of Zinc Sulphate and Sodium Valerate; evaporate and Zinc Valerate crystallizes out.

CHARACTERS.—White, pearly scales, having the odor of Valeric Acid, and a sweetish, astringent and metallic taste; on exposure to the air it slowly loses Valeric Acid. *Solubility.*—In about 50 parts of water, and about 35 parts of Alcohol; somewhat more soluble in Absolute Alcohol.

IMPURITIES.—Arsenic, cadmium, copper, lead, zinc butyrate, chloride and sulphate.

INCOMPATIBLES.—All acids, soluble carbonates, most metallic salts and vegetable astringents.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

ACTION.

By virtue of its volatile oil valerian is a local irritant, a stomachic, and a reflex cardiac and nervous stimulant; sufficient doses also affect the central nervous system independently and produce stimulation and subsequent depression of the nerve-cells, the higher divisions of the central axis being more markedly acted upon than the lower. Excretion takes place chiefly by the lungs and kidneys, and in the course of this action some irritation and increased secretion may be induced in these organs. In large doses it is a gastro-intestinal irritant.

USES.

Syncope; flatulence, especially in hysterical conditions; nervousness, hysteria and hysterical conditions generally.

CYPRIPEDIUM.

CYPRIPEDIUM. *Synonym.*—Ladies' Slipper. The dried rhizome and roots of *Cypripedium hirsutum* Miller (*Cypripedium pubescens* Willdenow), or of *Cypripedium parviflorum* Salisbury (Fam. *Orchidaceæ*). *Habitat.*—North America; in swampy places.

CHARACTERS.—Rhizome of horizontal growth, curved, 3 to 10 cm. long; 2 to 6 mm. thick; orange-brown to dark brown; the upper side beset with numerous circular, cup-shaped scars, closely covered below with simple, wiry roots, varying from 3 to 15 cm. in length; fracture of rhizome short, white, that of roots somewhat fibrous; odor distinct, heavy, valerian-like; taste sweetish, bitter and somewhat pungent.

COMPOSITION.—It contains—(1) A volatile oil. (2) A volatile acid. (3) Two resins. (4) Tannic acid.

Dose, 1 gm. (15 gr.).

Preparation.

Fluidextractum Cypripedii.—Fluidextract of Cypripedium. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

ACTION.

It is a gentle nervous stimulant, resembling valerian in its action.

USES.

Nervous diseases; epilepsy; neuralgia; hypochondriasis.

ASAFŒTIDA.

ASAFETIDA.—A gum-resin obtained from the root of *Ferula fœtida* (Bunge) Regel, and probably other species of *Ferula* (Fam. *Umbelliferæ*). *Habitat.*—Persia, Turkestan and Afghanistan.

CHARACTERS.—In irregular masses composed of tears of variable size embedded in a yellowish-brown or reddish-brown matrix; when fresh, the tears are tough, yellowish-white and translucent, or milky-white and opaque, changing gradually on exposure to pinkish and finally reddish-brown; the freshly fractured surface becomes greenish on the application of a few drops of a 40 per cent. Nitric Acid solution; becoming hard and brittle by drying; odor persistent, alliaceous; taste bitter, alliaceous and acrid. When triturated with water, Asafetida yields a milk-white emulsion which becomes yellowish on the addition of Ammonia Water. *Solubility.*—Not less than 50 per cent. should dissolve in Alcohol. *Resembling Asafetida.*—Galbanum, Ammoniacum, and Benzoin, distinguished by their peculiar odors, which differ markedly from that of Asafetida.

COMPOSITION.—The chief constituents are—(1) *A volatile oil*, 5 per cent., the most important ingredient of which is Allyl sulphide, which gives Asafetida its very unpleasant odor. (2) Gum, 25 per cent. (3) Bassorin resin, 65 per cent., which contains *Ferulaic Acid*, $C_{10}H_{10}O_4$.

IMPURITIES.—Earthy matter, Calcium Sulphate and Carbonate.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Preparations.

1. **Emulsum Asafœtidæ.**—Emulsion of Asafetida. *Synonym.*—Milk of Asafetida. Asafetida, 40; by rubbing in a warmed mortar with water, and straining to 1000.

Dose, 16 c.c. (4 fl. oz.).

2. **Pilulæ Asafœtidæ.**—Pills of Asafetida. Asafetida, 20;

Soap, 6 gm.; Water, a sufficient quantity; to make 100 pills. Each pill contains .20 gm. (3 gr.) of Asafetida.

Dose, 2 pills.

3. Tinctura Asafœtidæ.—Tincture of Asafetida. Asafetida, 200. By maceration with Alcohol, and filtration to 1000.

Dose, 1 c.c. (15 ♏).

ACTION.

That of the volatile oils in general; it especially stimulates the intestinal muscle.

USES.

Constipation; flatulence; hysterical conditions.

SUMBUL.

SUMBUL. *Synonym.*—Musk Root. The dried rhizome and root of an undetermined plant, probably of the family *Umbelliferæ*. *Habitat.*—Central and Northeastern Asia.

CHARACTERS.—In transverse segments, of variable length and rarely exceeding 10 cm. in diameter; externally dusky brown, annulate, longitudinally wrinkled, or with a smooth, silver-gray periderm; fracture short-fibrous, light yellow or brownish-yellow, spongy, porous, with numerous brownish-yellow resin reservoirs, and irregular, easily separabte fibres; bark about 0.5 mm. thick; odor strong, musk-like; taste bitter.

COMPOSITION.—The chief constituents are—(1) A volatile oil. (2) Two Resins. (3) *Valerianic Acid.* (4) *Sumbulic* and *Angelic Acids.*

Dose, 2 gm. (30 gr.).

Preparations.

1. Extractum Sumbul.—Extract of Sumbul. By evaporating the Fluidextract to a pilular consistence.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

2. Fluidextractum Sumbul.—Fluidextract of Sumbul. By percolation and maceration with Alcohol and water, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Appears to resemble that of the volatile oils in general. Sumbul is generally classed with the substances having malodorous oils, such as asafetida and valerian, and is regarded more particularly as an antispasmodic and nerve tonic.

Uses.

Colic and flatulence; nervous dyspepsia; hysteria; neuralgias occurring in hysterical subjects; neurotic migraine; chlorosis; neurasthenia; chorea; catarrhal and spasmodic conditions of the respiratory and genito-urinary tracts; alcoholic and other insomnia; the unrest of nervous females. It is usually associated with such other remedies as may be indicated by the condition present.

MYRRHA.

MYRRH.—A gum-resin obtained from *Commiphora Myrrha* (Nees) Engler (Fam. *Burseraceæ*). *Habitat.*—Eastern Africa and Southwestern Arabia.

Characters.—In roundish or irregular tears or masses, dusty, brownish-yellow or reddish-brown; fracture waxy, somewhat splintery, translucent on the edges, sometimes marked with whitish veins; odor balsamic; taste aromatic, bitter and acrid.

Composition.—The chief constituents are—(1) *Myrrhin*, $C_{48}H_{32}G_{10}$, a resin, 23 per cent. (2) *Myrrhol*, $C_{10}H_{14}O$, a volatile oil, 2 to 4 per cent. (3) Gum, 60 per cent. (4) A bitter principle.

Impurities.—Many varieties of gum and gum-resins.

Myrrh is contained in Mistura Ferri Composita and Pilulæ Rhei Compositæ.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparations.

1. **Pilulæ Aloes et Myrrhæ.**—Purified Aloes, 13; Myrrh, 6; Aromatic Powder, 4; Syrup, a sufficient quantity to make 100 pills.

   Dose, 2 pills.

2. **Tinctura Aloes et Myrrhæ.**—Purified Aloes, 100; Myrrh, 100; Glycyrrhiza, 100; Macerate with water and Alcohol, and percolate to 1000.

   Dose, 2 c.c. (30 ♏).

3. **Tinctura Myrrhæ.**—Tincture of Myrrh. Myrrh, 200; by maceration with Alcohol and filtration to 1000.

   Dose, 1 c.c. (15 ♏).

Action.

Antiseptic; tonic; stimulant; carminative; expectorant; emmenagogue; in large doses it is a gastro-intestinal irritant.

Uses.

Locally, indolent ulcers; relaxed uvula; pharyngitis; diphtheria; aphthous sore mouth; ulcerated or spongy gums; mercurial ptyalism; eczema; as an ingredient of dentifrices. Internally, chronic bronchitis; leucorrhœa; cystitis; atonic dyspepsia (especially when associated with flatulence or nervous disorders); amenorrhœa; as a carminative and stomachic in combination with purgatives.

CLASS II.—ACTING CHIEFLY ON THE BRONCHIAL MUCOUS MEMBRANE.

Terebene, Terpin Hydrate, Balsam of Peru, Balsam of Tolu, Storax, Grindelia, Oil of Pine.

TEREBENUM.

TEREBENE. $C_{10}H_{16} = 135.10$.—A liquid consisting of Dipentene and other hydrocarbons. It should be kept in well-stoppered bottles, in a cool place, protected from light.

Source.—Obtained by the action of concentrated Sulphuric Acid on Oil of Turpentine and subsequent rectification with steam.

Characters.—A colorless, thin liquid, having a rather agreeable thyme-like odor, and an aromatic, somewhat terebinthinate taste. Sp. gr., from 0.860 to 0.865. *Solubility.*—Only slightly soluble in Water, but soluble in three times its volume of Alcohol.

Impurities.—Unaltered oil of turpentine, resinous substances, acids.

Incompatibles.—The same as of Turpentine.

Dose, 0.5 c.c. (8 ♏).

Action.

Similar to that of oil of turpentine; it is expectorant and diuretic, and in the process of excretion has a disinfectant influence on both the renal and bronchial secretions.

Uses.

Externally as a general antiseptic dressing for wounds, ulcers, burns, etc.; internally in fermentative dyspepsia and genito-urinary diseases, but especially as a stimulating disinfectant expectorant in chronic bronchitis, emphysema, winter cough, and even phthisis. It is sometimes employed by inhalation.

TERPINI HYDRAS.

TERPIN HYDRATE. $C_{10}H_{18}(OH)_2 + H_2O = 188.74$. The Hydrate $[C_{10}H_{18}(OH)_2 + H_2O]$ of the Diatomic Alcohol Terpin.

SOURCE.—Rectified Oil of Turpentine, Alcohol and Nitric Acid are allowed to stand together for three or four days in shallow porcelain dishes. The crystals which have formed are collected, drained thoroughly, dried by absorbent paper, and re-crystallized in a cold solution of Alcohol.

CHARACTERS.—Colorless, lustrous, rhombic prisms, nearly odorless, and having a slightly aromatic and somewhat bitter taste. Permanent in the air. *Solubility.*—Soluble in about 200 parts of water and in 10 of Alcohol; in 32 parts of boiling water and 2 of boiling Alcohol; also soluble in about 100 parts of Ether, 200 parts of Chloroform, or 1 part of boiling Acetic Acid.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

ACTION.

Similar to that of terebene.

USES.

It has been given as an antiseptic in acute and chronic bronchitis, in whooping-cough, and occasionally in chronic nephritis, cystitis and gonorrhœa.

BALSAMUM PERUVIANUM.

BALSAM OF PERU.—A balsam obtained from *Toluifera Pereiræ* (Royle) Baillon (Fam. *Leguminosæ*). It is prepared from the bark after it has been beaten, scorched and removed. *Habitat.*—Central America. Balsam of Peru is named from its place of export.

CHARACTERS.—A viscid liquid of a dark brown color; free from stringiness or stickiness; transparent and reddish-brown in thin layers; of an agreeable vanilla-like odor and a bitter, acrid taste, with a persistent after-taste. When swallowed, it leaves a burning sensation in the throat. It does not harden on exposure to the air. Sp. gr., 1.140 to 1.150. *Solubility.*—Completely in Absolute Alcohol, Chloroform, or Glacial Acetic Acid; only partially soluble in Ether or Petroleum Benzin; soluble in 5 parts of Alcohol, with not more than a slight opalescence. Water, when agitated with it, shows an acid reaction.

COMPOSITION.—The chief constituents are—(1) A volatile oil. This is present in large quantites; it consists of *Cinnamein* (Benzylic Cinnamate), $C_9H_7(C_7H_7)O_2$, about 60 per cent. (2) *Cinnamic Acid*, $C_9H_8O_2$. (3) Resin, about 32 per cent., which on dry distillation yields *Benzoic Acid*, $HC_7H_5O_2$. Small quantities of (4) Benzylic Benzoate, $C_7H_5(C_7H_7)O_2$,

(5) Benzyl Alcohol, C_7H_8O, (6) Stilbene, $C_{14}H_{12}$, (7) Styrol, C_8H_8, and (8) *Styracin* or Cinnamyl Cinnamate, $C_9H_7(C_9H_9)O_2$.

IMPURITIES.—Fixed oils, fatty oils, rosin, acid resins, turpentine, storax, copaiba, cinnamein.

Dose, 1 gm. (15 gr.).

ACTION.

Antiseptic; parasiticidal; rubefacient; stomachic; carminative; expectorant. It is a general stimulant, with a special tendency to the mucous membranes.

USES.

Externally, wounds, compound fractures, indolent sores; burns, abscesses, chronic catarrhal conditions of the nose, ear or vagina, pruritus vulvæ, ringworm, scabies, pediculosis, etc.; internally, chronic bronchitis; intestinal catarrh; dysentery; gleet; leucorrhœa; chronic laryngitis (by inhalation).

BALSAMUM TOLUTANUM.

BALSAM OF TOLU.—A balsam obtained from *Toluifera Balsamum* Linné (Fam. *Leguminosæ*). *Habitat.*—Venezuela and New Granada.

CHARACTERS.—A yellowish-brown, plastic solid, becoming brittle when old or dried, or exposed to cold; transparent in thin layers; having a pleasant, aromatic odor, recalling that of Vanilla, and a mild, aromatic taste. *Solubility.*—Readily in Alcohol; also soluble in Chloroform and solutions of the fixed alkalies; almost completely soluble in Ether; nearly insoluble in water and Petroleum Benzin; partially soluble in Carbon Disulphide.

COMPOSITION.—The chief constituents are—(1) *Toluene*, C_7H_8, 1 per cent.; a thin, colorless, aromatic oil. (2) *Benzylic Benzoate*, $C_7H_5(C_7H_7)O_2$, a colorless, aromatic oil. (3) *Benzylic Cinnamate*, $C_9H_7(C_7H_7)O_2$. (4) *Benzoic Acid*, $HC_7H_5O_2$. (5) *Cinnamic Acid*, $C_9H_8O_2$. (6) Resins.

IMPURITIES.—Rosin, copaiba, saponifiable substances.

Dose, 1 gm. (15 gr.).

Balsam of Tolu is contained in Tinctura Benzoini Composita.

Preparations.

1. **Syrupus Tolutanus.**—Syrup of Tolu. Tincture of Tolu, 50; Magnesium Carbonate, 10; Sugar, 820; Water to 1000. By solution and filtration.

Dose, 16 c.c. (4 fl. dr.).

Syrup of Tolu is used to make Trochisci Ammonii Chloridi and Trochisci Cubebæ.

2. Tinctura Tolutana.—Tincture of Tolu. Balsam of Tolu, 200. By maceration with Alcohol and filtration to 1000.

Dose, 2 c.c. (30 ♏).

ACTION.

Resembles that of balsam of Peru.

USES.

As an expectorant and flavoring agent.

STYRAX.

STORAX.—A balsam obtained from the wood and inner bark of *Liquidambar orientalis* Miller (Fam. *Hamamelidaceæ*). *Habitat.*—Asia Minor.

CHARACTERS.—A semi-liquid, grayish, sticky, opaque mass, depositing, on standing, a heavy, dark-brown stratum; transparent in thin layers, and having an agreeable odor and a balsamic taste. *Solubility.*—Insoluble in water; completely soluble (with the exception of accidental impurities) in an equal weight of warm Alcohol.

COMPOSITION.—The chief constituents are—(1) *Styrol*, C_8H_8, or *Cinnamene*, a volatile oil. (2) *Cinnamic Acid*, $C_9H_8O_2$, colorless, odorless, crystalline; this can be oxidized to Benzoic Acid, and is also found in Cinnamon and Balsams to Tolu and Peru. (3) *Styracin*, or *Cinnamyl Cinnamate*, $C_9H_7(C_9H_9)O_2$. (4) *Phenylpropyl Cinnamate*, $C_9H_7(C_9H_{17})O_2$. (5) *Ethyl Cinnamate*, $C_9H_7(C_2H_5)O_2$. (6) *Storesin*, $C_{36}H_{58}O_3$, in considerable quantity. (7) *Vanillin*, having a fragrant odor.

Dose, 1 gm. (15 gr.).

Storax is contained in Tinctura Benzoini Composita.

ACTION.

The same as that of the balsam of Tolu and of benzoin, and also resembles that of copaiba.

USES.

Ulcers and skin diseases requiring stimulation; as a parasiticide in scabies and pediculosis. Internally, as an expectorant and in gonorrhœa, gleet and catarrhal affections of the genito-urinary organs.

GRINDELIA.

GRINDELIA.—The dried leaves and flowering tops of *Grindelia robusta* Nuttall, or of *Grindelia squarrosa* (Pursh) Dunal (Fam. *Compositæ*). *Habitat.*—(1) *G. robusta*, North America, west of the Rocky Mountains, in

marshes. (2) *G. squarrosa*, Western Plains to the Sierra Nevada and south to Texas.

CHARACTERS.—Leaves about 5 cm. or less long, varying from broadly spatulate or oblong to lanceolate, sessile or clasping, obtuse, more or less sharply serrate, often spinosely toothed, or even laciniate-pinnatifid, pale green, smooth, finely dotted, thickish, brittle; heads many-flowered, more or less resinous-viscid, either conical-urceolate (*G. squarrosa*), or depressed-urceolate (*G. robusta*); the involucre hemispherical, about 10 mm. broad, composed of numerous imbricated, squarrosely-tipped or spreading scales; ray-florets yellow, ligulate, pistillate; disk-florets yellow, tubular, perfect; pappus of two or three, mostly unequal, awns about the length of the disk-florets; odor balsamic; taste pungently aromatic and bitter.

COMPOSITION.—The chief constituents are—(1) A volatile oil. (2) A resin, resembling Saponin in its action. (3) Probably an alkaloid, *Grindeline*.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Grindeliæ.—Fluidextract of Grindelia. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Stomachic; diuretic; expectorant; it appears to have a special action in relaxing the muscular coats of the bronchi, and the terminations of the sensory nerves supplying the bronchial mucous membrane are also said to be depressed by it.

USES.

Locally, ivy-poisoning; herpes; burns and blisters; chronic or irritable ulcers; iritis; gonorrhœa; gleet; vaginitis. By inhalation of the fumes from the burning leaves, asthma; hay-fever; whooping-cough; the spasmodic difficulty of breathing accompanying various pulmonary and cardiac diseases. Also internally, in association with other expectorants, for bronchitis and emphysema.

Unofficial Preparation.

Oleum Pini.—Oil of Pine. The oil is distilled from the fresh leaves of *Pinus pumilio* (Fam. *Pinaceæ* or *Coniferæ*). *Synonyms.*—Pinol. Pumiline. Fir-wood Oil. *Habitat.*—Russia.

CHARACTERS.—Almost colorless. Odor aromatic. Taste pungent. Sp. gr., 0.865 to 0.870. *Solubility.*—In 7 parts of Alcohol.
COMPOSITION.—(1) Various terpenes. (2) Boruyl Acetate.

ACTION.

The same as that of oil of turpentine.

USES.

It is much more agreeable than oil of turpentine, and is used mostly in sprays and inhalations for various affections of the respiratory passages.

CLASS III.—ACTING CHIEFLY ON THE GASTRO-INTESTINAL TRACT.

Pyrethrum, Cloves, Eugenol, Pimenta, Pepper, Myristica, Cinnamon, Capsicum, Ginger, Cardamom, Oil of Lavender Flowers, Peppermint, Spearmint, Anise, Coriander, Fennel, Caraway, Hedeoma, Anthemis, Matricaria, Red Rose.

PYRETHRUM.

PYRETHRUM. *Synonym.*—Pellitory. The root of *Anacyclus Pyrethrum* (Linné) De Candolle (Fam. *Compositæ*). *Habitat.*—Highlands of Northern Africa.

CHARACTERS.—Somewhat fusiform, nearly simple, 5 to 10 cm. long, 3 to 20 mm. in diameter; externally dark brown or grayish-brown, longitudinally wrinkled and somewhat furrowed, crown somewhat annulate and sometimes tufted with coarse fibres or with soft woolly hairs; fracture short; bark dark brown, resinous, 0.5 to 1 mm. thick, closely adhering to the light yellow, radiate, porous wool; odor distinct; taste pungent, very acrid, producing a prompt sialogogue effect. *Resembling Pyrethrum.*—Taraxacum, which is darker and has not a burning taste.

COMPOSITION.—The chief constituents are—(1) Two volatile oils. (2) An acrid, brown Resin. (3) Inulin, which in many plants replaces starch, 50 per cent.

Dose, 2 gm. (30 gr.).

Preparation.

Tinctura Pyrethri.—Tincture of Pyrethrum. Pyrethrum, 200; by maceration and percolation with Alcohol to 1000.

ACTION.

Rubefacient; sternutatory; sialogogue; internally it has the

characteristic action of the volatile oils, and when taken in sufficient amount may cause severe gastro-enteritis and more or less stupor.

Uses.

As a masticatory in paralysis of the tongue and when in other conditions an increased flow of saliva is desired; locally in neuralgic, rheumatic, or other painful affections of the tongue or teeth, relaxed uvula, scorbutic or other forms of sore mouth, and chronic catarrh of the frontal sinuses. Its sialogogue action has been employed for the removal of iodine from the system in chronic poisoning by that drug.

CARYOPHYLLUS.

CLOVES.—The dried flower buds of *Eugenia aromatic* (Linné) O. Kuntze (Fam. *Myrtaceæ*). *Habitat.*—Molucca Islands; cultivated in tropical countries.

Characters.—About 15 mm. long, brownish-black, consisting of a stem-like, solid calyx-tube, obscurely four-angled and granular roughened, terminated by four teeth, and surmounted by a globular head, formed of four petals, which cover numerous curved stamens, and one style; odor strongly aromatic; taste pungent and aromatic, followed by slight numbness. Cloves should not float in a horizontal position on water.

Composition.—The chief constituents are—(1) *Oleum Caryophylli* (*see* below), 18 per cent. (2) *Eugenin*, $C_{20}H_{12}O_2$, a crystalline body. (3) *Caryophyllin*, $C_{10}H_{16}O$, a neutral body isomeric with Camphor.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Cloves are contained in Tinctura Lavandulæ Composita, Tinctura Rhei Aromatica, and Vinum Opii.

OLEUM CARYOPHYLLI.—Oil of Cloves. A volatile oil distilled from Cloves, yielding, when assayed, not less than 80 per cent. of Eugenol. Like most other volatile oils, it should be kept in well-stoppered, amber-colored bottles, in a cool place, protected from light.

Characters.—A colorless or pale yellow, thin liquid, becoming darker and thicker by age and exposure to the air, having a strongly aromatic odor of Cloves, and a pungent and spicy taste. Sp. gr., 1.040 to 1.060. *Solubility.*—Soluble in an equal volume of Alcohol.

Composition.—The chief constituents are—(1) *Eugenol* (*see* below), 85 per cent. It forms permanent Salts with Alkalies, and is found also in Oil of Pimenta. (2) A terpene (Caryophyllene), $C_{15}H_{25}$.

Impurity.—Phenol.

INCOMPATIBLES.—Lime water, iron salts, mineral acids, gelatin.
Dose, 0.2 c.c. (3 ♏).

EUGENOL.

EUGENOL. $C_{10}H_{12}O_2 = 162.86$.—An unsaturated, aromatic phenol $[C_6H_3(OH)(OCH_3) \cdot C_3H_5\ 4:3:1]$ obtained from Oil of Cloves and other sources. It should be kept in well-stoppered, amber-colored bottles, in a cool place, protected from light.

CHARACTERS.—A colorless, or pale yellow, thin liquid, having a strongly aromatic odor of cloves, and a pungent and spicy taste. Exposure to air causes it to become darker and thicker. Sp. gr., from 1.066 to 1.068. *Solubility.*—Miscible with Alcohol in all proportions.

IMPURITY.—Phenol.
Dose, 0.2 c.c. (3 ♏).

ACTION.

Antiseptic; parasiticidal; rubefacient; irritant; anæsthetic; markedly stomachic and carminative. In the course of its excretion it exerts a more or less irritant influence on the kidneys and respiratory passages, the secretions of which it tends to disinfect. It has the characteristic action of the volatile oils, and its stimulating gastric effects are the most important produced by it.

USES.

Locally, toothache; neuralgia; pediculosis; eczema; lupus vulgaris. Internally, gastric and intestinal pain and flatulence; vomiting; as a carminative to prevent the griping of purgatives.

PIMENTA.

PIMENTA. *Synonym.*—Allspice. The dried, nearly ripe fruit of *Pimenta officinalis* Lindley (Fam. *Myrtaceæ*). *Habitat.*—Tropical America; cultivated.

CHARACTERS.—Subglobular, 5 to 7 mm. in diameter, crowned with a short, 4-parted calyx and a short style, or their remnants; externally dark brown; pericarp brittle, about 1 mm. thick, glandular-punctate; 2-celled, each cell containing one reddish-brown plano-convex, roundish-reniform seed; odor and taste peculiarly and agreeably aromatic. *Resembling Pimenta.*—Pepper, which has no calyx; Cubeb, which is stalked.

COMPOSITION.—The chief ingredient is *Oleum Pimentæ* (*see* below), which is chemically almost identical with the volatile oil found in cloves.
Dose, 1 gm. (15 gr.).

OLEUM PIMENTÆ.—Oil of Pimenta. *Synonym.*—Oil of Allspice. A volatile oil distilled from Pimenta, yielding, when assayed, not less than 65 per cent., by volume, of Eugenol.

CHARACTERS.—A colorless, yellow, or reddish liquid, having a strong, aromatic odor of Allspice and a pungent, spicy taste. Sp. gr., 1.033 to 1.048. *Solubility.*—With 90 per cent. Alcohol miscible in all proportions; also soluble in 2 volumes of 70 per cent. Alcohol.

COMPOSITION.—(1) *Eugenol*, 70 per cent. (2) A sesquiterpene.

Dose, 0.2 c.c. (3 ♏).

ACTION.

The same as that of cloves and oil of cloves.

USES.

The same as those of cloves and oil of cloves.

PIPER.

PEPPER. *Synonym.*—Black Pepper. The dried unripe fruit of *Piper nigrum* Linné (Fam. *Piperaceæ*). *Habitat.*—India; cultivated in the tropics.

CHARACTERS.—Nearly globular, 4 to 5 mm. in diameter, externally brownish- or grayish-black; pericarp thin, coarsely wrinkled, enclosing a single whitish, more or less imperfectly developed seed; odor strong, penetrating, provoking sneezing; taste aromatic and very pungent. *Resembling Black Pepper.*—Pimenta, which has a calyx; Cubeb, which is stalked.

COMPOSITION.—The chief constituents are—(1) An *Oleoresin*, readily yielding a volatile oil (1 to 2 per cent.), with the odor of pepper, and a resin. (2) *Piperine* (*see* below), 6 to 8 per cent.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparation.

Oleoresina Piperis.—Oleoresin of Pepper. By percolation with Acetone, distillation and evaporation of the residue.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

PIPERINA.—Piperine. $C_{17}H_{19}NO_3 = 283.04$. A feebly basic substance ($CH_2O_2 \cdot C_6H_3 \cdot CH:CH \cdot CH:CH \cdot CON \cdot C_5H_{10}$) obtained from Pepper and other plants of the *Piperaceæ*.

CHARACTERS.—Colorless or pale yellowish, glistening, monoclinic crystals, odorless, permanent in the air, and containing no water of crystallization. When put into the mouth it is at first tasteless, but on prolonged contact it develops a sharp, biting taste. *Solubility.*—Insoluble in water; soluble in 15 parts of Alcohol, 36 of Ether, and 1.7 of Chloroform; in 4.4

parts of Alcohol at 60° C. (140° F.). Isomeric with Morphine, it decomposes into Piperic Acid, $C_{12}H_{10}O_4$, and a liquid Alkaloid *Piperidine*, $C_5H_{11}N$.

Dose, 0.200 gm. = 200 milligm. (3 gr.).

Action.

Similar to that of other substances containing volatile oils; it is reputed to be feebly antipyretic and antiperiodic.

Uses.

As a condiment; as a gargle for relaxed conditions of the throat; flatulence; rectal diseases; cholera; malarial fevers; externally, as a counter-irritant.

MYRISTICA.

MYRISTICA.—*Synonym.*—Nutmeg. The kernel of the ripe seed of *Myristica fragrans* Houttuyn (Fam. *Myristicaceæ*). *Habitat.*—Molucca Islands; cultivated in tropical countries.

Characters.—Ovoid or ellipsoidal, about 25 mm. long, externally light brown, reticulately furrowed, with a circular scar on the broad end; internally more or less mottled from the infolding of the light brown perisperm and tegmen with the yellowish-brown endosperm; easily cut, the cut surface having a waxy lustre; odor strongly aromatic; taste aromatic, warm and slightly bitter.

Composition.—The chief constituents are—(1) The *fixed oil*, 25 to 30 per cent. (*see* below). (2) The *volatile oil* (*see* below), 2 to 8 per cent.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Myristica is contained in Acetum Opii, Fluidextractum Aromaticum, Pulvis Aromaticus, Tinctura Lavandulæ Composita, and Tinctura Rhei Aromatica.

OLEUM MYRISTICÆ.—Oil of Myristica. A volatile oil distilled from Myristica.

Characters.—A thin, colorless or pale yellow liquid, having a characteristic odor of Myristica, and a warm, spicy taste. Sp. gr., 0.862 to 0.910. *Solubility.*—In an equal volume of Alcohol.

Composition.—The chief constituents are—(1) *Myristicene*, $C_{10}H_{16}$, a terpene. (2) *Myristicol*, $C_{10}H_{14}O$, a stearopten, isomeric with Carvol.

Dose, 0.2 c.c. (3 ♏).

Oil of Myristica is contained in Spiritus Ammoniæ Aromaticus.

Action.

Antiseptic; aromatic; carminative; narcotic.

Uses.

In cookery, for its pleasant stomachic qualities; nausea; colic; diarrhœa; delirium tremens. Externally, rheumatism, neuralgia, paralysis, etc.; ringworm; itching and painful hæmorrhoids.

CINNAMOMUM.

CINNAMOMUM SAIGONICUM.—Saigon Cinnamon. The bark of an undetermined species of *Cinnamomum* (Fam. *Lauraceæ*). *Habitat.*—China.

Characters.—In quills about 15 cm. long, and 10 to 15 mm. in diameter, the bark 2 or 3 mm. thick; outer surface gray or light grayish-brown with whitish patches, more or less rough from numerous warts and some transverse ridges and fine longitudinal wrinkles; the inner surface cinnamon-brown or dark brown, granular and slightly striate; fracture short, granular, in the outer layer cinnamon-colored, having near the cork numerous whitish striæ forming an almost uninterrupted line; odor fragrant; taste sweet, warmly aromatic, somewhat astringent.

Saigon Cinnamon is contained in Tinctura Cardamomi Composita, Gambir Composita, Lavandulæ Composita, and Rhei Aromatica, and in Vinum Opii.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

Preparations.

1. **Fluidextractum Aromaticum.** — Aromatic Fluidextract. Aromatic Powder, by maceration and percolation with Alcohol.
   Dose, 1 c.c. (15 ♏).

2. **Pulvis Aromaticus.**—Aromatic Powder. Saigon Cinnamon, 35; Ginger, 35; Cardamom, 15; Myristica, 15.
   Dose, 1 gm. (15 gr.).

   Aromatic Powder is contained in Pilulæ Aloes et Ferri and Pilulæ Aloes et Myrrhæ.

3. **Tinctura Cinnamomi.**—Tincture of Cinnamon. Saigon Cinnamon, 200; Glycerin, 75; Alcohol and Water to 1000. By maceration and percolation.
   Dose, 2 c.c. (30 ♏).

CINNAMOMUM ZEYLANICUM. — Ceylon Cinnamon. The inner bark of the shoots of *Cinnamomum zeylanicum* Breyne (Fam. *Lauraceæ*). *Habitat.*—Ceylon; cultivated.

Characters.—Long, closely-rolled quills, composed of eight or more layers of bark of the thickness of paper; pale yellowish-brown; outer surface

smooth, marked with wavy lines of bast-bundles; inner surface striate; fracture short splintery; odor fragrant; taste sweet and warmly aromatic.

COMPOSITION.—The chief constituents are—(1) A Volatile Oil, ½ to 1½ per cent. (2) Tannic Acid. (3) Sugar. (4) Mannit.

IMPURITY.—Cassia Bark.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

OLEUM CINNAMOMI.—Oil of Cinnamon. Oil of Cassia. A volatile oil distilled from Cassia Cinnamon. It should yield not less than 75 per cent. by volume of Cinnamic Aldehyde.

CHARACTERS.—A yellowish or brownish liquid, becoming darker and thicker by age and exposure to the air, having the characteristic odor of Cinnamon and a sweetish, spicy, and burning taste. Sp. gr., 1.045 to 1.055. *Solubility.*—In 2 volumes of 70 per cent. Alcohol.

COMPOSITION.—The chief constituents are—(1) *Cinnamic Aldehyde*, $C_9H_8O = 131.07$, which makes up the greatest part. (2) *Eugenol*, found also in the oils of Cloves and Myristica. (3) In old oil, *Cinnamic Acid*, $HC_9H_7O_2 = 145.95$. A colorless, crystalline, volatilizable substance, slightly soluble in water, readily soluble in Alcohol, and convertible by Nitric Acid, with heat, into Benzoic Acid. Dose, .30 to .60 gm.; 5 to 10 gr.

IMPURITIES.—Copper, lead, petroleum, rosin.

Dose, 0.05 c.c. (1 ♏).

Oil of Cinnamon is contained in Acidum Sulphuricum Aromaticum.

Preparations.

1. Aqua Cinnamomi.—Cinnamon Water. Oil of Cinnamon, 2; by trituration with Purified Talc, 15, and addition of Distilled Water to 1000.

Dose, 16 c.c. (4 fl. dr.).

Cinnamon Water is contained in Infusum Digitalis and Mistura Cretæ.

2. Spiritus Cinnamomi.—Spirit of Cinnamon. Oil of Cinnamon, 100; Alcohol, 900.

Dose, 2 c.c. (30 ♏).

Spirit of Cinnamon is contained in Syrupus Rhei.

CINNALDEHYDUM.—Cinnamic Aldehyde. $C_9H_8O = 131.07$. An aldehyde obtained from Oil of Cinnamon or prepared synthetically, containing not less than 95 per cent. of pure Cinnamic Aldehyde ($C_3H_5 \cdot CH{:}CH \cdot COH$); nearly identical with the oil distilled from Cassia Cinnamon. It should be kept in small amber-colored, well-stoppered bottles.

CHARACTERS.—A colorless liquid, having a cinnamon-like odor and a burning, aromatic taste. Sp. gr., about 1.047. *Solubility.*—Sparingly

in water; soluble in all proportions in Alcohol, Ether and fixed and volatile oils.

IMPURITY.—Chlorinated products.

Dose, 0.05 c.c. (1 ♏).

ACTION.

The oil has the stomachic and carminative action of the aromatic oils in general; the bark is astringent.

USES.

Cinnamon is much used as an ingredient of carminative and astringent powders and mixtures, and is also combined with purgatives to prevent griping. On account of its tannic acid it is incompatible with iron preparations. Spice plasters made with aromatic powder are employed for counter-irritation, especially in children.

CAPSICUM.

CAPSICUM. *Synonyms.*—Cayenne Pepper. Guinea Pepper. African Pepper. The dried, ripe fruit of *Capsicum fastigiatum* Blume (Fam. *Solanaceæ*), deprived of its calyx. *Habitat.*—Tropical America; cultivated in tropical countries.

CHARACTERS.—Oblong-conical, from 10 to 20 mm. long, with a red, shining membranous and translucent pericarp; 2-celled, and containing 10 to 12 flat, reniform, yellowish seeds attached to a thick, central placenta; odor distinct; taste intensely pungent. Dried and powdered it constitutes red pepper.

COMPOSITION.—The chief constituents are—(1) *Capsaicin*, $C_9H_{14}NO_2$, a crystallizable acrid substance. (2) *Capsicin*, a volatile Alkaloid, smelling like Coniine. (3) A fixed oil. (4) A Resin. (5) Fatty matter.

IMPURITIES.—Various red substances, e. *g.*, red-lead.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Capsicum is contained in Pilulæ Podophylli, Belladonnæ et Capsici.

Preparations.

1. Emplastrum Capsici.—Capsicum Plaster. Oleoresin of Capsicum and Adhesive Plaster spread on fabric. The Oleoresin is applied by means of a brush, so as to form a thin coating.

2. Fluidextractum Capsici.—Fluidextract of Capsicum. By maceration and percolation with Alcohol, and evaporation.

Dose, 0.05 c.c. (1 ♏).

3. Oleoresina Capsici.—Oleoresin of Capsicum. By percolation with Acetone, distillation, and evaporation of the residue.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

4. Tinctura Capsici.—Tincture of Capsicum. Capsicum, 100. By percolation with Alcohol and Water to 1000.

Dose, 0.5 c.c. (8 ♏).

Action.

It is a powerful local irritant; small doses are stomachic, while large ones cause gastro-enteritis; it is a powerful stimulant to the heart, and sometimes acts as an aphrodisiac; it is chiefly eliminated by the kidneys, and moderate amounts increase the flow of urine.

Uses.

Locally, throat affections; alopecia; toothache; as a rubefacient and counter-irritant generally. Internally, flatulent colic; subacute and chronic alcoholism; delirium tremens; chronic parenchymatous nephritis; functional inactivity of the kidneys; impotence; spermatorrhœa; impaired digestion of convalescence from acute diseases.

ZINGIBER.

GINGER.—The dried rhizome of *Zingiber officinale* Roscœ (Fam. *Zingiberaceæ*). *Habitat.*—India; cultivated in the tropics.

Characters.—Laterally compressed, irregularly branched pieces; externally whitish or pale buff, longitudinally striate; fracture short-fibrous, mealy, showing numerous small oil and resin cells and circular groups of fibro-vascular bundles; odor agreeably aromatic; taste aromatic and pungent. *Resembling Ginger.*—Turmeric, which is yellow.

Composition.—The chief constituents are—(1) An aromatic volatile oil (¾ to 2 per cent.), giving the flavor. (2) Resin. (3) *Gingerol*, to which the pungent taste is due (Thresh).

Dose, 1 gm. (15 gr.).

Ginger is contained in Fluidextractum Aromaticum, Pulvis Rhei Compositus, and Pulvis Aromaticus.

Preparations.

1. Fluidextractum Zingiberis.—Fluidextract of Ginger. By maceration and percolation with Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

2. Oleoresina Zingiberis.—Oleoresin of Ginger. By percolation with Acetone, distillation, and evaporation of the residue.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

3. Syrupus Zingiberis.—Syrup of Ginger. Fluidextract of Ginger, 30; Alcohol, 20; Sugar, 820; Water to 1000. By trituration with Magnesium Carbonate, 10, solution and filtration.

Dose, 16 c.c. (4 fl. dr.).

4. Tinctura Zingiberis.—Tincture of Ginger. Ginger, 200. By percolation with Alcohol to 1000.

Dose, 2 c.c. (30 ♏).

Tincture of Ginger is contained in Acidum Sulphuricum Aromaticum.

Action.

The same as that of other substances containing aromatic volatile oils.

Uses.

Flatulence; diarrhœa; atonic dyspepsia. It is much used as a stomachic, carminative and flavoring agent, and is a favorite domestic remedy for colic and the pain due to acute suppression of the menses.

CARDAMOMUM.

CARDAMOM.—The dried nearly ripe fruit of *Elettaria repens* (Sonnerat) Baillon (Fam. *Zingiberaceæ*). *Habitat.*—Malabar; cultivated in India.

Characters.—Oblong-ovoid, obtusely triangular in transverse section, from 10 to 20 mm. long, slightly beaked at the apex, rounded to truncate at the base; three-celled and with central placentæ; pericarp thin, nearly tasteless, and of a pale yellow color; seeds 15 to 18 in number, about 4 mm. long, oblong-ovoid and irregularly angular, reddish-brown, enclosed in a thin, membranous aril; odor and taste strongly and agreeably aromatic. The seeds alone contain active and valuable constituents.

Composition.—The chief constituents are—(1) A volatile oil, 4 to 5 per cent., which contains a terpene, $C_{10}H_{16}$, called *Terpinene.* (2) A fixed oil, 10 to 11 per cent.

Dose, 1 gm. (15 gr.).

Cardamom is contained in Extractum Colocynthidis Compositum, Fluidextractum Aromaticum, Pulvis Aromaticus, Tinctura Gentianæ Composita, and Tinctura Rhei.

Preparations.

1. **Tinctura Cardamomi.**—Tincture of Cardamom. Cardamom, 200. By maceration and percolation with Diluted Alcohol to 1000.

Dose, 4 c.c. (1 fl. dr.).

2. **Tinctura Cardamomi Composita.**—Compound Tincture of Cardamom. Cardamom, 25; Saigon Cinnamon, 25; Caraway, 12; Cochineal, 5; Glycerin, 50. By percolation with Diluted Alcohol to 1000.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

Carminative; stomachic.

USES.

In flatulent colic and as a flavoring agent.

OLEUM LAVANDULÆ FLORUM.

OIL OF LAVENDER FLOWERS.—A volatile oil distilled from the fresh flowering tops of *Lavandula officinalis* Chaix (Fam. *Labiatæ*). *Habitat.*—Southern Europe; cultivated.

CHARACTERS.—A colorless or yellow liquid, having the fragrant odor of Lavender Flowers, and a pungent and slightly bitter taste. Sp. gr., 0.875 to 0.910. *Solubility.*—In 3 parts of 70 per cent. Alcohol.

COMPOSITION.—The chief constituents are—(1) *Linalool Acetate* (also found in Oil of Bergamot). (2) *Linalool*, $C_{10}H_{18}O$, which is an alcohol and an oxidation product of the terpene, Myrcene, $C_{10}H_{16}$. It is isomeric with Borneol (*see* pp. 258, 353), Geraniol (*q. v.*) and Menthol (*see* p. 246). (3) *Cineol*, also found in Oil of Eucalyptus (*see* p. 399) and other volatile oils.

IMPURITY.—Alcohol.

Oil of Lavender Flowers is contained in Linimentum Saponis Mollis, Spiritus Ammoniæ Aromaticus, and Unguentum Diachylon.

Dose, 0.2 c.c. (3 ♏).

Preparations.

1. **Spiritus Lavandulæ.**—Spirit of Lavender. Oil of Lavender Flowers, 50; Alcohol, 950.

Spirit of Lavender is used in Mistura Ferri Composita.

Dose, 2 c.c. (30 ♏).

2. **Tinctura Lavandulæ Composita.**—Compound Tincture of Lavender. Oil of Lavender Flowers, 8; Oil of Rosemary, 2; Saigon Cinnamon, 20; Cloves, 5; Myristica, 10; Red Saunders,

10; Alcohol and Water, each a sufficient quantity to make 1000. By mixing and percolation.

Dose, 2 c.c. (30 ♏).

Compound Tincture of Lavender is contained in Liquor Potassii Arsenitis.

ACTION.

The same as oil of cloves and other aromatic volatile oils.

USES.

Headache; nausea; flatulence and colic; gastralgia; fainting; hysterical and other nervous conditions; as an adjuvant or corrigent of other medicines.

MENTHA PIPERITA.

PEPPERMINT.—The dried leaves and flowering tops of *Mentha piperita* Linné (Fam. *Labiatæ*). *Habitat.*—Wild in Asia, Europe, and North America; cultivated.

CHARACTERS.—Branches quadrangular, with scattered, deflexed hairs; leaves petiolate, ovate-lanceolate, 3 to 8 cm. long, acute, sharply serrate, light or dark green; flower-whorls in oblong or oval spikes which are usually compact, or somewhat interrupted at the base, 1 to 1.5 cm. broad, rounded at the summit, when in fruit becoming 3 to 7 cm. long; calyx tubular, 5-toothed and often purplish; corolla small, purplish, and 4-lobed; stamens four, short and equal; odor strong and characteristic; taste pungent and cooling.

COMPOSITION.—Its chief constituents are—(1) A volatile oil (*see* below); (2) A liquid, and (3) a crystalline *Menthol.*

Dose, 4 gm. (60 gr.).

OLEUM MENTHÆ PIPERITÆ.—Oil of Peppermint. A volatile oil distilled from the fresh or partly dried leaves and flowering tops of Peppermint, rectified by steam distillation, and yielding, when assayed, not less than 6 per cent. of Ester, calculated as Menthyl Acetate, and not less than 50 per cent. of total Menthol (free and as Ester).

CHARACTERS.—A colorless liquid, having the characteristic, strong odor of Peppermint, and a strongly aromatic, pungent taste, followed by a sensation of cold when air is drawn into the mouth. Sp. gr., 0.894 to 0.914.

COMPOSITION.—The chief constituents are—(1) *Menthene*, $C_{10}H_{18}$, the liquid Terpene obtained by distillation. (2) *Menthol*, the solid Stearopten (*q. v.*), 50 to 65 per cent.

Dose, 0.2 c.c. (3 ♏).

Oil of Peppermint is contained in Pilulæ Catharticæ Vegetabiles and Pilulæ Rhei Compositæ.

Preparations.

1. Aqua Menthæ Piperitæ.—Peppermint water. Oil of Peppermint, 2. By trituration with purified Talc, 15, and filtration with distilled Water to 1000.

Dose, 16 c.c. (4 fl. dr.).

2. Spiritus Menthæ Piperitæ.—Spirit of Peppermint. *Synonym.*—Essence of Peppermint. Oil of Peppermint, 100; Peppermint, 10. By maceration and percolation with Alcohol to 1000.

Dose, 2 c.c. (30 ♏).

Spirit of Peppermint is contained in Mistura Rhei et Sodæ.

ACTION.

That of volatile oils generally; the sensation of coolness and numbness which sometimes attends the external application of these agents is particularly marked in the case of oil of peppermint, on account of the menthol in its composition. Like many other volatile oils, especially those containing a considerable amount of terpene, it is actively antiseptic.

USES.

Externally, neuralgia; myalgia; various rheumatic and gouty pains; pruritus of the genitals. Internally, as a stomachic, carminative and flavoring agent; by inhalation in phthisis.

MENTHA VIRIDIS.

SPEARMINT.—The dried leaves and flowering tops of *Mentha spicata* Linné (*Mentha viridis* Linné) (Fam. *Labiatæ*). *Habitat.*—Wild in Europe and North America; cultivated.

CHARACTERS.—Closely resembling Peppermint, but the leaves usually sessile and lanceolate, flower spikes usually slender, interrupted, cylindrical or crowded, conical at the apex, 5 to 8 mm. thick, becoming when in fruit 5 to 10 cm. long; the stamens rather long; odor and taste resembling, but distinguishable from those of Peppermint.

COMPOSITION.—(1) A volatile oil (*see* below). (2) Resin. (3) Gum.

Dose, 4 gm. (60 gr.).

OLEUM MENTHÆ VIRIDIS.—Oil of Spearmint. A volatile oil distilled from the fresh or partly dried leaves and flowering tops of Spearmint, rectified by steam distillation.

CHARACTERS.—A colorless, yellow, or greenish-yellow liquid, having the characteristic, strong odor of Spearmint, and a hot, aromatic taste.

Sp. gr., 0.914 to 0.934. *Solubility.*—With an equal volume of 80 per cent. Alcohol it forms a clear solution, which upon further dilution becomes turbid.

COMPOSITION.—The chief constituents are—(1) *Menthene,* the same terpene as in Peppermint. (2) *Carvol,* $C_{10}H_{14}O$, a Stearopten isomeric with Thymol (*q. v.*).

Dose, 0.2 c.c. (3 ♏).

Preparations.

1. **Aqua Menthæ Viridis.**—Spearmint water. Oil of Spearmint, 2. By trituration with Purified Talc, 15, addition of Distilled Water and filtration to 1000.

Dose, 16 c.c. (4 fl. dr.).

2. **Spiritus Menthæ Viridis.**—Spirit of Spearmint. *Synonym.*—Essence of Spearmint. Oil of Spearmint, 100; Spearmint, 10. By maceration with Alcohol and filtration to 1000.

Dose, 2 c.c. (30 ♏).

ACTION.

The same as that of peppermint, but is effects are less pronounced.

USES.

The same as those of peppermint; its oil is not so agreeable as oil of peppermint, and it is in less general use than peppermint.

ANISUM.

ANISE.—The ripe fruit of *Pimpinella Anisum* Linné (Fam. *Umbelliferæ*), obtained from cultivated plants. *Habitat.*—Western Asia, Egypt, Southeastern Europe; cultivated.

CHARACTERS.—Ovoid, laterally compressed, 4 to 5 mm. long; carpels usually cohering and attached to a slender pedicle; grayish or greenish-gray to grayish-brown; each with a flat face and five light brown filiform ridges and about 16 oil-tubes; odor and taste agreeable and aromatic. *Resembling Anise.*—Conium, which has single mericarps, smooth, grooved upon the face, and having crenate ridges with wrinkles between them, and no oil-tubes.

COMPOSITION.—The chief constituent is the official *volatile oil* (*see* below).

IMPURITY.—Conium.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

OLEUM ANISI.—Oil of Anise. A volatile oil distilled from Anise or from the fruit of Star Anise, *Illicium verum* Hooker filius (Fam. *Magnoliaceæ*). It should be preserved like other volatile oils, and, if it has separated into a liquid and a solid portion, it should be completely liquefied by warming, and then well shaken, before being dispensed.

CHARACTERS.—A colorless or pale yellow, thin, and strongly refractive liquid, having the characteristic odor of Anise and a sweetish, mildly aromatic taste. Sp. gr., 0.975 to 0.988. *Solubility.*—In an equal volume of Alcohol.

COMPOSITION.—The chief constituents are—(1) A Terpene, $C_{10}H_{16}$, in small quantity. (2) A Stearopten, *anethol*, $C_{10}H_{12}O$, 80 per cent.

IMPURITIES.—Alcohol, petroleum, oil of turpentine, oil of fennel, fixed oils, volatile oils containing phenols.

Dose, 0.2 c.c. (3 ♏).

Oil of Anise is contained in Spiritus Aurantii Compositus, Syrupus Sarsaparillæ Compositus, Tinctura Opii Camphorata, and Trochisci Glycyrrhizæ et Opii.

Preparations.

1. **Aqua Anisi.**—Anise water. Oil of Anise, 2. By trituration with Purified Talc, 15, addition of Distilled Water, and filtration to 1000.

Dose, 16 c.c. (4 fl. dr.).

2. **Spiritus Anisi.**—Spirit of Anise. Oil of Anise, 100; Alcohol, 900.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

That of aromatic volatile oils generally.

USES.

As a carminative, especially for infants and young children, as an ingredient of cough mixtures, and as a flavoring agent.

CORIANDRUM.

CORIANDER.—The dried ripe fruit of *Coriandrum sativum* Linné (Fam. *Umbelliferæ*). *Habitat.*—Central Asia and Southern Europe; cultivated.

CHARACTERS.—Nearly globular, brownish-yellow, smooth, 4 to 5 mm. in diameter; crowned with the calyx-teeth and a short stylopodium; mericarps usually united, each with five prominent, straight primary ribs and four indistinct secondary ribs, the inner surface deeply concave and with two oil-tubes; odor and taste agreeably aromatic.

COMPOSITION.—The chief constituent is the official *volatile oil* (*see* below).
Dose, 0.500 gm. = 500 milligm. (7½ gr.).

OLEUM CORIANDRI.—Oil of Coriander. A volatile oil distilled from Coriander.

CHARACTERS.—A colorless or slightly yellow liquid, having the characteristic, aromatic odor of Coriander, and a warm, spicy taste. Sp. gr., 0.863 to 0.878. *Solubility.*—It should be soluble in 3 volumes of 70 per cent. Alcohol; soluble in all proportions in 80 per cent. and 90 per cent. Alcohol.

COMPOSITION.—(1) *Pinene*, the chief terpene of Oil of Turpentine, 5 per cent. (2) *Coriandrol*, $C_{10}H_{18}O$, which is isomeric with Borneo Camphor (*q. v.*).

Dose, 0.2 c.c. (3 ♏).

Oil of Coriander is contained in Confectio Sennæ, Spiritus Aurantii Compositus, and Syrupus Sennæ.

ACTION.

That of other aromatic volatile oils.

USES.

For flavoring purposes, for disguising the taste of senna and rhubarb, and for preventing the griping of these and other purgatives.

FŒNICULUM.

FENNEL.—The dried, nearly ripe fruit of *Fœniculum vulgare* Miller (Fam. *Umbelliferæ*). *Habitat.*—Levant and Southern Europe; cultivated.

CHARACTERS.—Mericarps usually separated, each 4 to 10 mm. long, and 2 to 3 mm. broad, more or less curved, with five prominent, light-colored primary ribs, otherwise smooth, yellowish- or brownish-green; pericarp containing an oil-tube between each two ribs, and two upon the flat side; odor and taste aromatic, anise-like. *Resembling Fennel.*—Conium fruit (Fennel is larger and has prominent oil-tubes), Caraway and Anise fruits.

COMPOSITION.—The chief constituent is the official volatile oil, probably chemically identical with Oil of Anise (*see* p. 377).

Fennel is contained in Infusum Sennæ Compositum.

Dose, 1 gm. (15 gr.).

OLEUM FŒNICULI.—Oil of Fennel. A volatile oil distilled from Fennel. If partly or wholly solidified, it should be completely liquefied by warming, and then well shaken, before being dispensed.

CHARACTERS.—A colorless or pale yellow liquid, having the characteristic,

aromatic odor of Fennel and a sweetish, mild and spicy taste. Sp. gr., 0.953 to 0.973. *Solubility.*—In an equal volume of Alcohol.

IMPURITY.—Volatile oils containing phenols.

Dose, 0.2 c.c. (3 ♏).

Oil of Fennel is contained in Pulvis Glycyrrhizæ Compositus and Spiritus Juniperi Compositus.

Preparation.

Aqua Fœniculi.—Fennel water. Oil of Fennel, 2. By trituration with Purified Talc, 15, addition of Distilled Water, and filtration to 1000.

Dose, 16 c.c. (4 fl. dr.).

ACTION.

The same as that of anise and other similar oils. Fennel has been supposed to have the effect of increasing the secretion of milk, urine, perspiration and bronchial mucus, and to have some emmenagogue action.

USES.

As a stomachic, carminative and emmenagogue, and to prevent the griping of purgatives.

CARUM.

CARAWAY.—The dried fruit of *Carum Carvi* Linné (Fam. *Umbelliferæ*). *Habitat.*—Central and Western Asia; cultivated.

CHARACTERS.—About 4 or 5 mm. long; oblong, laterally usually separated into the two mericarps, which are curved, tapering toward each end, dark brown, with five yellowish, filiform ribs, and with six oil-tubes; seed plane upon the face, nearly equilaterally pentagonal in transverse section; odor and taste agreeably aromatic. *Resembling Caraway.*—Conium and Fennel. Caraway is known by its small ridges and spicy taste.

COMPOSITION.—The chief constituent is the official volatile oil (*see* below), 5 to 7 per cent.

Dose, 1 gm. (15 gr.).

Caraway is contained in Tinctura Cardamomi Composita.

OLEUM CARI.—Oil of Caraway. A volatile oil distilled from Caraway and rectified by steam distillation.

CHARACTERS.—A colorless, or pale yellow, thin liquid, having the characteristic, aromatic odor of Caraway, and a spicy taste. Sp. gr., 0.900 to 0.910. *Solubility.*—In an equal volume of Alcohol.

COMPOSITION.—The chief constituents are—(1) *Cymene*, $C_{10}H_{14}$; also

found in Oil of Eucalyptus (*see* p. 399). (2) *Carvol*, $C_{10}H_{14}O$, isomeric with Thymol (*q. v.*), also found in Oil of Spearmint. (3) *Limonene*, a terpene, $C_{10}H_{16}$; also found in Oil of Lemon (*q. v.*).

Dose, 0.2 c.c. (3 ♏).

Oil of Caraway is contained in Spiritus Juniperi Compositus.

ACTION.

The same as that of other aromatic volatile oils.

USES.

Chiefly as a flavoring agent and a carminative for flatulent colic, especially in infants.

HEDEOMA.

HEDEOMA. *Synonym.*—Pennyroyal. The dried leaves and flowering tops of *Hedeoma pulegioides* (Linné) Persoon (Fam. *Labiatæ*). *Habitat.*—North America, south to Georgia, and west to Dakota; in sandy fields.

CHARACTERS.—Branchlets quadrangular, with numerous spreading hairs; leaves opposite, short-petioled, oblong-ovate, 15 to 35 mm. long, thin, obtuse, obscurely serrate, glandular-hairy beneath; flowers in axillary fascicles, with a tubular-ovoid, bilabiate and 5-toothed calyx, and a pale blue, spotted, bilabiate corolla, containing two sterile and two fertile, exserted stamens; odor strong, somewhat mint-like; taste aromatic and pungent.

COMPOSITION.—The chief constituent is the official volatile oil.

Dose, 8 gm. (120 gr.).

OLEUM HEDEOMÆ.—Oil of Hedeoma. *Synonym.*—Oil of Pennyroyal. A volatile oil distilled from Hedeoma.

CHARACTERS.—A pale yellow, limpid liquid, having a characteristic, pungent, mint-like odor and taste. Sp. gr., 0.920 to 0.935. *Solubility.*—It should form a clear solution with 2 volumes of 70 per cent. Alcohol.

Dose, 0.2 c.c. (3 ♏).

ACTION.

It is a gentle aromatic stimulant.

USES.

Flatulent colic; sick stomach; locally, for mosquito bites.

ANTHEMIS.

ANTHEMIS. *Synonym.*—Chamomile. The dried flower-heads of *Anthemis nobilis* Linné (Fam. *Compositæ*), collected from cultivated plants. *Habitat.*—Southern and Western Europe; cultivated; naturalized in a few localities in the United States.

CHARACTERS.—Subglobular, 1.5 to 2 cm. broad, consisting of an imbricated involucre and numerous white, strap-shaped, obscurely three-toothed ray florets, and usually a few tubular disk-florets, inserted upon a chaffy, conical, solid receptable; odor agreeable; taste strongly aromatic and bitter.

COMPOSITION.—The chief constituent is the volatile oil.

Dose, 2 gm. (30 gr.).

ACTION.

That of the aromatic volatile oils generally.

USES.

Principally as a stomachic and carminative; it is a popular domestic remedy for colds, dyspepsia and intestinal disorders.

MATRICARIA.

MATRICARIA. *Synonym.*—German Chamomile. The dried flower-heads of *Matricaria Chamomilla* Linné (Fam. *Compositæ*). *Habitat.*—Europe and Western Asia.

CHARACTERS.—About 6 or 8 mm. broad, exclusive of the rays, with a flattish imbricated involucre, a conical, hollow, and naked receptacle, 10 to 20 white ligulate and reflexed pistillate ray-florets which are about 8 mm. long, and numerous yellow, tubular, perfect disk-florets without pappus; odor somewhat disagreeably aromatic; taste strongly aromatic and bitter. *Resembling Matricaria.*—Anthemis arvensis and Anthemis Cotula, but these have conical, solid, and chaffy receptacles.

COMPOSITION.—(1) Volatile Oil, ¼ per cent. (2) Anthemic Acid. (3) *Anthemidin*, probably a glucoside. (4) Tannic acid.

Dose, 16 gm. (240 gr.).

ACTION.

The same as that of chamomile.

USES.

The same as those of chamomile.

ROSA GALLICA.—Red Rose. The dried petals of *Rosa gallica* Linné (Fam. *Rosaceæ*), collected before expanding. *Habitat.*—Asia Minor and Southern Europe; cultivated.

CHARACTERS.—Usually in small cones, consisting of numerous imbricated, roundish, retuse, deep purplish-red, yellow-clawed petals, having a characteristic odor and a bitterish, slightly acidulous, and distinctly astringent taste.

COMPOSITION.—The chief constituents are—(1) A volatile oil, in minute quantities. (2) Tannic Acid. (3) Mucilage. (4) Sugar.

Red Rose is contained in Pilulæ Aloes et Mastiches.

Preparations.

1. **Confectio Rosæ.**—Confection of Rose. Red Rose, 80; Sugar, 640; Clarified Honey, 120; Stronger Rose Water, 160.

2. **Fluidextractum Rosæ.**—Fluidextract of Rose. By maceration with Glycerin and Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 m).

3. **Mel Rosæ.**—Honey of Rose. Fluidextract of Rose, 120; Clarified Honey, to 1000.

Dose, 4 c.c. (1 fl. dr.).

4. **Syrupus Rosæ.**—Syrup of Rose. Fluidextract of Rose, 125; Diluted Sulphuric Acid, 10; Sugar, 750; Water to 1000.

OLEUM ROSÆ.—Oil of Rose. *Synonym.*—Attar of Rose. A volatile oil distilled from the fresh flowers of *Rosa damascena* Mueller (Fam. *Rosaceæ*), having, when assayed, a saponification value of not less than 10 or more than 17. *Habitat.*—Cultivated in Bulgaria.

CHARACTERS.—A pale yellowish, transparent liquid, having the strong, fragrant odor of Rose, and a mild, slightly sweetish taste. Sp. gr., 0.855 to 0.865. *Solubility.*—The addition of 70 per cent. Alcohol precipitates the paraffin hydrocarbons, but forms a clear solution with the other constituents of the oil; the solution being slightly acid to Litmus Test Solution.

COMPOSITION.—Its principal constituent is *Rhodinol*, or *Geraniol*, $C_{10}H_{18}O$, a volatile oil, 12 to 14 per cent., very fragrant. It is an alcohol and is related to Linalool which occurs in Oil of Lavender flowers.

IMPURITIES.—Oil of gingergrass or Turkish oil of geranium, oil of rose geranium, spermaceti, paraffin.

Preparations.

1. **Aqua Rosæ.**—Rose Water. Stronger Rose Water, and Distilled Water, of each, one volume.

Dose, 16 c.c. (4 fl. dr.).

2. **Aqua Rosæ Fortior.**—Stronger Rose Water. *Synonym.*—Triple Rose Water. Water saturated with the volatile oil of Rose petals, obtained by distillation. It should be kept in bottles loosely stoppered with a pledget of purified cotton, and in a dark place. Stronger Rose Water should be colorless and clear, not mucilaginous, and should have the odor of roses, free from empyreuma.

IMPURITY.—Metallic matters.

Dose, 8 c.c. (2 fl. dr.).

3. Unguentum Aquæ Rosæ.—Ointment of Rose Water. *Synonym.*—Cold Cream. Spermaceti, 125; White Wax, 120; Expressed Oil of Almond, 560; Stronger Rose Water, 190; Sodium Borate, 5.

ACTION.

Astringent.

USES.

The ointment is a favorite soothing application for the skin, and the water an agreeable excipient for collyria, lotions and urethral injections.

CLASS IV.—ACTING CHIEFLY ON THE KIDNEYS AND THE GENITO-URINARY TRACT.

Oil of Juniper, Buchu, Copaiba, Oil of Thyme, Cubeb, Oil of Santal, Matico.

OLEUM JUNIPERI.

OIL OF JUNIPER.—A volatile oil distilled from the fruit of *Juniperus communis* Linné (Fam. *Coniferæ*). *Habitat.*—North America throughout Canada, the Northern United States, and in the Rocky Mountains south to New Mexico.

CHARACTERS.—A colorless or faintly green or yellow liquid, having the characteristic odor of Juniper, and a warm, aromatic, somewhat terebinthinate and slightly bitter taste. Sp. gr., 0.860 to 0.880. *Solubility.*—In 10 volumes of 90 per cent. Alcohol.

COMPOSITION.—Oil of Juniper is composed chiefly of terpenes, which are mostly *Pinene* and Cadinene.

Dose, 0.2 c.c. (3 ♏).

Preparations.

1. Spiritus Juniperi.—Spirit of Juniper. Oil of Juniper, 50; Alcohol, 950.

Dose, 2 c.c. (30 ♏).

2. Spiritus Juniperi Compositus.—Compound Spirit of Juniper, Oil of Juniper, 8; Oil of Caraway, 1; Oil of Fennel, 1; Alcohol, 1400; Water to 2000.

Dose, 8 c.c. (2 fl. dr.).

ACTION.

Antiseptic; stomachic; diaphoretic; diuretic; aphrodisiac. Oil of juniper is a powerful renal stimulant.

Uses.

Much used in the treatment of dropsies, whether dependent upon disease of the liver, heart or kidneys. It should never be prescribed when acute nephritis is present.

BUCHU.

BUCHU. *Synonym.*—Bucco. The dried leaves of *Barosma betulina* (Thunberg) Bartling et Wendland (Fam. *Rutaceæ*). *Habitat.*—Southern Africa.

Characters.—About 15 mm. long, varying between oval and obovate, yellowish-green, apex obtuse, margin crenate or serrate, with a gland at the base of each tooth, the base more or less wedge-shaped; coriaceous, both surfaces beset with numerous slight projections; odor strong and characteristic; taste somewhat mint-like, pungent and bitterish. *Resembling Buchu.*—Senna and Uva Ursi, which have entire leaves.

Impurity.—Leaves of *Emplanum serrulatum*, which have no glands.

Composition.—The chief constituents are—(1) A yellowish-brown volatile oil, from the glands. (2) A stearopten (*Diosphenol*, $C_{10}H_{16}O_2$), in solution in a liquid hydrocarbon. The stearopten is deposited on exposure to air. (3) A glucoside, *Barosmin*, soluble in alcohol (scarcely so, if cold) and in ether, volatile oils, dilute acids and alkalies. (4) *Rutin*, a bitter principle. (5) Mucilage.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Buchu.—Fluidextract of Buchu. By maceration and percolation with Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

Action.

Stomachic; diuretic; diaphoretic; expectorant; after its elimination by the kidneys it acts as a disinfectant of the urinary tract.

Uses.

Chiefly in chronic affections of the mucous membrane of the genito-urinary tract; atonic dyspepsia; dropsy; bronchitis.

COPAIBA.

COPAIBA. *Synonyms.*—Copaiva. Balsam of Copaiba. (This is not a true balsam because it does not contain cinnamic or benzoic acid.) An oleoresin derived from one or more South American species of Copaiba (Fam. *Leguminosæ*). *Habitat.*—Brazil, Venezuela and New Granada.

CHARACTERS.—A pale yellow to brownish-yellow, more or less transparent and viscid liquid, sometimes fluorescent; having a peculiar, aromatic odor and a persistent, bitter and acrid taste. Sp. gr., 0.950 to 0.995. *Solubility.*—Insoluble in water; soluble, or showing at most a slight opalescence, in absolute Alcohol, Carbon Disulphide, Petroleum Benzin, and fixed and volatile oils; completely soluble in Ether and Chloroform.

COMPOSITION.—The chief constituents are—(1) *The volatile oil*, 48 to 85 per cent. (*see* below). (2) *The Resin*, 15 to 52 per cent. (unofficial), which exists dissolved in the oil. It consists of two Resins: (*a*) *Copaivic Acid*, $C_{20}H_{30}O_{22}$, the chief constituent, a crystalline Resin, with a faint odor, a bitter taste, insoluble in water, easily soluble in absolute Alcohol and Ammonia; (*b*) a non-crystallizable, viscid Resin, 1½ per cent.

IMPURITIES.—Turpentine, detected by the smell on heating; fixed oils (these leave a greasy ring round the resinous stain when heated on paper); Gurjun balsam, which coagulates at 132° C. (270° F.), while Cobaiba does not; paraffin oils; resin.

Dose, 1 c.c. (15 ♏).

OLEUM COPAIBÆ.—Oil of Copaiba. A volatile oil distilled from Copaiba.

CHARACTERS.—A colorless or pale yellow liquid, having the characteristic odor of Copaiba, and an aromatic, slightly bitter, and pungent taste. It is isomeric with Turpentine, $C_{10}H_{16}$. Sp. gr., 0.895 to 0.905. *Solubility.*—In 2 volumes of Alcohol.

COMPOSITION.—It consists chiefly of the hydrocarbon, *Caryophyllene* (*see* p. 364).

Dose, 0.5 c.c. (8 ♏).

It may be suspended in Mucilage of Acacia, 45 c.c. (1½ fl. oz.) for every 30 c.c. (1 fl. oz.) of Oil of Copaiba or in yolk of egg. Cinnamon or Peppermint Water, with Tincture of Orange or Ginger, covers the taste. It may be dissolved in water with the aid of Liquor Potassii Hydroxidi, with which it forms a soap, or it may be given in capsules.

ACTION.

In small doses it is stomachic, in large ones a gastro-intestinal irritant; in the process of excretion it stimulates and disinfects mucous membranes, especially those of the genito-urinary tract, and on the skin it may give rise to eruptions and annoying itching. It is also diuretic, and in large amounts irritates the kidneys.

Uses.

Externally, chronic skin diseases, indolent ulcers, chilblains, sore nipples, fissure of the anus, etc.; internally, gonorrhœa, gleet, bronchitis, hepatic ascites, cardiac dropsy.

OIL OF TH ...MI.

...ed from the leaves and flowering tops of *Thy*... *Labiatæ*), and containing, when assayed, not le... ...lume, of phenols. *Habitat.*—Southern Fran...

CHARACTERS. ... a strong odor of Thyme, and an aromatic, p... ...aste. Sp. gr., 0.900 to 0.930. *Solubility.*—In ...

COMPOSITION.—Its chief constituents are the hydrocarbons.—(1) *Cymene*, $C_{10}H_{14}$. (2) *Thymene*, $C_{10}H_{16}$.

IMPURITY.—Official phenol.

Dose, 0.2 c.c. (3 ♏).

Action.

Antiseptic, and somewhat similar to that of copaiba.

Uses.

Chiefly as a source of thymol; bronchitis; gleet; leucorrhœa; vesical catarrh.

CUBEBA.

CUBEB.—The dried unripe, but fully grown, fruit of *Piper Cubeba* Linné filius (Fam. *Piperaceæ*). *Habitat.*—Java; cultivated.

CHARACTERS.—From 10 to 13 mm. long, the upper portion globoidal, about 4 or 5 mm. in diameter, contracted at the base into a rounded stipe about 6 or 8 mm. long; pericarp reticulately wrinkled, blackish-gray, internally light brown, smooth, oily, one-seeded, brittle; of a strongly aromatic, somewhat camphoraceous odor and taste. *Resembling Cubeb.*—Pepper and Pimenta; neither has a stalk.

COMPOSITION.—The chief constituents are—(1) *The volatile oil*, 5 to 15 per cent. (*see* below). (2) *The Oleoresin*, 6 per cent. (*see* below), which contains *Cubebin*, a white, crystalline, odorless substance, and *Cubebic Acid*. (3) A little Piperine.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Fluidextractum Cubebæ.**—Fluidextract of Cubeb. By maceration and percolation with Alcohol, and evaporation.

Dose, 1 c.c. (15 ♏).

2. **Oleoresina Cubebæ.**—Oleoresin of Cubeb.

SOURCE.—By percolation with Alcohol; distil off, and evaporate the Alcohol. The waxy and crystalline matter which is deposited after this preparation has been standing for some time should be rejected, the liquid portion only being used.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Oleoresin of Cubeb is used to make Trochisci Cubebæ.

3. **Trochisci Cubebæ.**—Troches of Cubeb. Oleoresin of Cubeb, 2; Oil of Sassafras, 1; Extract of Glycyrrhiza, 25; Acacia, 12 gm.; Syrup of Tolu, sufficient quantity to make 100 troches. Each troche contains .02 c.c.; ⅓ m., of the Oleoresin.

OLEUM CUBEBÆ.—Oil of Cubeb. A volatile oil distilled from Cubeb.

CHARACTERS.—A colorless, pale green, or yellow liquid, having the characteristic odor of Cubeb, and a warm, camphoraceous, aromatic taste. Sp. gr., 0.905 to 0.925. An alcoholic solution of the oil is neutral to litmus paper.

COMPOSITION.—The chief constituents are—(1) *Cubeb Camphor*, $C_{15}H_{26}O$, a Stearopten. (2) Two oils, $C_{15}H_{24}$. (3) A small amount of a Terpene.

Dose, 0.5 c.c. (8 ♏).

ACTION.

Rubefacient; irritant to the stomach; diuretic; like other volatile oils, it causes some cardiac stimulation and also stimulates the functions of the organs by which it is excreted; sometimes produces a papular or erythematous rash. Its chief action is on the mucous membrane of the genito-urinary tract, which is both stimulated and disinfected by it. Its resinous acid is believed to aid the effects of the oil in its action upon the renal epithelium, as well as the bronchial mucous membrane.

USES.

Gonorrhœa; gleet; functional irritability of the bladder; chronic cystitis; nocturnal enuresis; chronic catarrh of the colon and

rectum; asthma, hay fever, nasal catarrh, pharyngitis, bronchitis, and various other affections of the respiratory passages.

OLEUM SANTALI.

OIL OF SANTAL. A volatile oil distilled from the wood of *Santalum album* Linné (Fam. *Santalaceæ*), which should yield not less than 90 per cent. of alcohols, calculated as Santalol. *Habitat.*—Southern India.

CHARACTERS.—[illegible]ick liquid, having a peculiar, aromatic odor, an[illegible] Sp. gr., 0.965 to 0.975. *Solubility.*—Readily i[illegible]

COMPOSITION.—[illegible]hol, 90 per cent.

IMPURITIES.—[illegible]ther varieties of Sandalwood Oil. The latter [illegible]arization. This oil is lævogyrate; its angle of [illegible]an — 16° nor more than — 20° in a 100 mm. tu[illegible] C. (77° F.).

Dose, 0.5 c.c (8 ♏).

ACTION.

Closely resembles that of copaiba and cubeb, but oil of santal is less irritant and more palatable.

USES.

Gonorrhœa; gleet; cystitis; pyelitis; urethral hæmorrhage; bronchitis.

MATICO.

MATICO.—The leaves of *Piper angustifolium* Ruiz and Pavon (Fam. *Piperaceæ*). *Habitat.*—Tropical America.

CHARACTERS.—From 10 to 15 cm. long, short-petiolate, oblong-lanceolate; apex pointed, base unequally heart-shaped, margin very finely crenulate, tessellated above, reticulate beneath, the meshes small, and the veins densely brownish-hairy; aromatic, spicy, bitterish and astringent. *Resembling Matico leaves.*—Digitalis leaves, which are less deeply reticulated.

COMPOSITION.—The chief constituents are—(1) Volatile oil, 2½ per cent. (2) A pungent resin. (3) A bitter principle. (4) *Artanthic Acid.* (5) Tannic acid.

Dose, 4 gm. (60 gr.).

Preparation.

Fluidextractum Matico.—Fluidextract of Matico. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

Much the same as cubeb; the leaves promote the clotting of blood.

USES.

Has been given for the same cases as cubeb, but is now rarely used. The leaves may be applied to bleeding surfaces.

CLASS V.—ACTING CHIEFLY ON THE FEMALE GENITAL ORGANS.

Savin.

SABINA.

SAVIN.—The tops of *Juniperus Sabina* Linné (Fam. *Coniferæ*). *Habitat.*—Siberia, Europe, Canada and Northern United States.

CHARACTERS.—Short, thin, subquadrangular branchlets; leaves rather dark green, in four rows, opposite, scale-like, ovate-lanceolate, more or less acute, appressed, imbricated, having on the back a shallow groove containing an oblong or roundish gland; odor peculiar, terebinthinate; taste nauseous, resinous and bitter.

COMPOSITION.—The chief constituent is the volatile oil (*see* below), about 2 per cent.

Dose, 0.5 gm. (7½ gr.).

Preparation.

Fluidextractum Sabinæ.—Fluidextract of Savin. By maceration and percolation with Alcohol, and evaporation.

Dose, 0.3 c.c. (5 ♏).

OLEUM SABINÆ.—Oil of Savin. A volatile oil distilled from the fresh tops of Savin.

CHARACTERS.—A colorless or yellowish liquid, having a peculiar terebinthinate odor and a pungent, bitter and camphoraceous taste. Sp. gr., 0.903 to 0.923. *Solubility.*—Soluble in about one-half volume or more of 90 per cent. Alcohol.

COMPOSITION.—It contains several terpenes.

Dose, 0.05 c.c. (1 ♏).

ACTION.

The same general action as oil of turpentine, but more marked. It differs from this in powerfully irritating the ovaries and uterus; it is also an ecbolic.

Uses.

A cerate made from the fluidextract has been used as a powerful counter-irritant. Internally savin may be given as an emmenagogue, but its employment is to be discouraged, as it is liable to cause serious gastro-enteritis.

CLASS VI.—ACTING CHIEFLY ON THE SKIN.

Turpentine, Oil of Erigeron, Tar, Oil of Cade, Rosin, Canada Turpentine, Mustard, Oil of Cajuput, Eucalyptus, Eucalyptus Gum, Oil of Rosemary, Arnica, Mezereum.

TEREBINTHINA.

TURPENTINE.—A concrete oleoresin obtained from *Pinus palustris* Miller, and from other species of *Pinus* (Fam. *Pinaceæ* or *Coniferæ*). *Habitat.*—United States; in the Atlantic and Gulf States from Virginia to Texas.

Characters.—In yellowish, opaque masses, brittle in the cold; lighter internally, sticky and more or less glossy; odor and taste terebinthinate.

Turpentine is contained in Ceratum Resinæ Compositum.

OLEUM TEREBINTHINÆ.

OIL OF TURPENTINE.—A volatile oil recently distilled from Turpentine.

Characters.—A thin, colorless liquid, having a characteristic odor and taste, both of which become stronger and less pleasant by age and exposure to the air. Sp. gr., 0.860 to 0.870. Dissolves Resins (the solution forms varnish), Wax Sulphur, Phosphorus and Iodine. *Solubility.*—In 3 times its volume of Alcohol. It is easily oxidized. Old Oil of Turpentine is an oxidizing agent; it readily absorbs Oxygen, and becomes converted into an Oleoresin. French Oil of Turpentine is lævorotatory, some of it comes from *Pinus maritima;* English Oil of Turpentine, which mostly comes from America, and Russian Oil of Turpentine are dextrorotatory.

Composition.—Oil of Turpentine is a mixture of (1) several isomeric hydrocarbons (*terpenes*), all having the formula $C_{10}H_{16}$. The chief of them found in the oil are *pinene, phellandrene, limonene,* and *dipentene.* They vary in their boiling points and the direction in which they rotate the plane of polarization. The principal terpene in American oil of turpentine is dextropinene; the principal terpene in French oil of turpentine is lævopinene. (2) Sesquiterpenes, $C_{15}H_{24}$. (3) Bornyl acetate. Most turpentine contains from 20 to 30 per cent. of the Oil of Turpentine. Many official volatile oils, viz., Oils of Lavender, Cubeb, Juniper, Peppermint,

Chamomile, Caraway, Cloves, contain various terpenes, all isomeric, and all having the formula, $C_{10}H_{16}$. An oxidation product of terpene is Camphor, $C_{10}H_{16}O$, which is pharmacopœial (*see* Camphor), and there are other such products which are not official.

IMPURITIES.—Rosin, paraffin oils, petroleum, petroleum benzin, kerosine and similar hydrocarbons.

INCOMPATIBLES.—Bromine, chlorine, iodine water.

Two parts of mucilage, with thorough trituration, emulsify one part of Oil of Turpentine with sixteen parts of water.

Preparations.

1. **Emulsum Olei Terebinthinæ.**—Emulsion of Oil of Turpentine. Rectified Oil of Turpentine, 15; Expressed Oil of Almond, 5; Syrup, 25; Acacia, 15; Water to 100. The Acacia and the Oils are thoroughly shaken together, and about half the water is then incorporated by vigorous shaking. When the Oil has been completely emulsified, the Syrup and the rest of the water are added in divided portions, with shaking after each addition.

Dose, 4 c.c. (1 fl. dr.).

2. **Linimentum Terebinthinæ.**—Turpentine Liniment. Rosin Cerate, 650; Oil of Turpentine, 350. By melting and mixing.

3. **Oleum Terebinthinæ Rectificatum.**—Rectified Oil of Turpentine.

SOURCE.—Oil of Turpentine; Solution of Sodium Hydroxide, each, a sufficient quantity. By shaking and distillation.

CHARACTERS.—A thin, colorless liquid, having the general properties mentioned under Oil of Turpentine. Sp. gr., 0.860 to 0.865.

Dose, 1 c.c. (15 ♏).

ACTION.

Antiseptic, irritant; hæmostatic; carminative; anthelmintic; purgative. It has the characteristic action of the volatile oils, promoting gastric digestion and reflexly stimulating the heart. After a large dose the stimulation is followed by depression, and the blood-pressure falls. In its action on the nerve cells turpentine differs from some of the other volatile oils in that the preliminary stimulation caused by large amounts is only transitory, being quickly followed by weakness and depression. Toxic doses produce loss of reflex action, insensibility and coma. It is in part excreted by the bronchial mucous membrane, and during

such excretion may have an antiseptic as well as stimulant action. It is largely excreted also by the kidneys, and it causes not only diuresis but marked irritation of the whole genito-urinary tract (strangury). The odor of violets is imparted to the urine by it.

Uses.

Externally as a rubefacient, counter-irritant, and antiseptic and parasiticide; internally as a stomachic and carminative and as a hæmostatic. It is used in chronic intestinal catarrh (especially with tympanites), subacute dysentery, typhoid and other fevers, septicæmia, pneumonia, bronchitis, biliary calculi, tapeworm, and chronic affections of the genito-urinary apparatus.

OLEUM ERIGERONTIS.

OIL OF ERIGERON. *Synonym.*—Oil of Fleabane. A volatile oil distilled from the fresh, flowering herb of *Erigeron canadensis* Linné (Fam. *Compositæ*). *Habitat.*—North America in fields and waste places; naturalized in other countries.

Characters.—A pale yellow, limpid liquid, becoming darker and thicker by age and exposure to the air, having a peculiar aromatic, persistent odor and an aromatic, slightly pungent taste. Sp. gr., 0.845 to 0.865. *Solubility.*—In an equal volume of Alcohol.

Impurities.—Oils of turpentine and fireweed.

Dose, 1 c.c. (15 ♏).

Action.

Similar to that of turpentine, except that it is less irritant.

Uses.

Externally, to prevent insects from injuring the skin. Internally, diarrhœa; dysentery; hæmorrhages; chronic renal disease.

PIX LIXUIDA.

TAR.—A product obtained by the destructive distillation of the wood of *Pinus palustris*, Miller, or of other species of *Pinus* (Fam. *Pinaceæ* or *Coniferæ*). *Habitat.*—United States.

Characters.—Semi-liquid, viscid, blackish-brown, non-crystalline, translucent in thin layers, becoming granular and opaque with age; odor empyreumatic, terebinthinate; taste sharp and empyreumatic. *Solubility.*—Almost

entirely soluble in Alcohol; soluble in fixed or volatile oils, or solutions of Potassium or Sodium Hydroxide. It is heavier than water and is slightly soluble in it, the solution being of a pale yellowish-brown color and having an acid reaction. On distillation it gives off an empyreumatic oil (oil of tar), which is official (*see* below), and pyroligneous acid. What remains behind is pitch. This is black and solid; melting in boiling water.

COMPOSITION.—Tar is a very complex substance. The chief constituents are—(1) *Oil of Turpentine* (*see* p. 390). (2) *Creosote* (*see* p. 290). (3) *Phenols* (*see* p. 189). (4) Pyrocatechin, or Catechol, $C_6H_6O_2$ (*see* Gambir). (5) Acetic Acid. (6) Acetone. (7) Xylol. (8) Toluol. (9) Methylic Alcohol. (10) Resins.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Preparations.

1. Syrupus Picis Liquidæ.—Syrup of Tar. Tar, 5; Alcohol, 50; Magnesium Carbonate, 10; Sugar, 850; Water, to 1000. The Tar is intimately mixed with twice its weight of clean white sand, and water added. The mass having been thoroughly kneaded, the water is poured off and the residue treated with Alcohol. When the Tar is dissolved, the Magnesium Carbonate and one-ninth part of the Sugar are added. After thorough trituration, water is added, and the mixture filtered. The remainder of the Sugar is dissolved in the clear filtrate by gentle heat, and, after straining, more water is added.

Dose, 4 c.c. (1 fl. dr.).

2. Unguentum Picis Liquidæ.—Tar Ointment. Tar, 500; Yellow Wax, 150; Lard, 350.

OLEUM PICIS LIQUIDÆ.—Oil of Tar. A volatile oil distilled from Tar.

CHARACTERS.—An almost colorless liquid when freshly distilled, but soon acquiring a dark, reddish-brown color, and having a strong, tarry odor and taste. Sp. gr., about 0.965. *Solubility.*—Readily in Alcohol.

Dose, 0.2 c.c. (3 ♏).

ACTION.

Antiseptic; irritant; expectorant; diuretic.

USES.

Chiefly in the local treatment of skin diseases, especially those of a scaly nature, such as psoriasis; also used externally for unhealthy wounds or sores and by inhalation in affections of the

air-passages. Internally, for chronic bronchitis and for certain chronic skin diseases.

OLEUM CADINUM.

OIL OF CADE. *Synonym.*—Juniper Tar Oil. A product of the dry distillation of the wood of *Juniperus Oxycedrus* Linné (Fam. *Coniferæ*). *Habitat.*—Medit[illegible] Africa, Spain, Portugal and France; in wast[illegible]sides.

CHARACTERS.—[illegible]wn, clear, thick liquid, having a tarry odor, a[illegible]g, somewhat bitter taste. *Solubility.*—Almos[illegible]arts to it an acid reaction; only partially solub[illegible]uble in Ether.

COMPOSITIO[illegible]e as that of Tar.

Similar to that [illegible]cade preparations have decidedly less odor and are less injurious to the clothing.

USES.

Externally, in chronic eczema, psoriasis, pityriasis rubra, lichen, prurigo and various forms of pruritus; also as a parasiticide in favus and other varieties of tinea.

RESINA.

ROSIN. *Synonyms.*—Resin. Colophony. The residue left after distilling off the Volatile Oil from Turpentine.

CHARACTERS.—Usually in sharp, angular fragments, translucent, amber-colored, usually covered with a yellowish dust; at ordinary temperatures brittle, pulverizable; fracture shiny and shallow-conchoidal; odor and taste faintly terebinthinate. Sp. gr., 1.070 to 1.080. *Solubility.*—In Alcohol, Ether, and fixed or volatile oils; also in solutions of Potassium or Sodium Hydroxide.

COMPOSITION.—Rosin may be considered as containing Abietic Acid Anhydride, $C_{44}H_{64}O_5$, 80 to 90 per cent.

INCOMPATIBLES.—Menthol, phenyl salicylate, phenol, thymol, urethane.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

Rosin is contained in Ceratum Cantharidis.

Preparations.

1. Ceratum Resinæ.—Rosin Cerate. *Synonym.*—Basilicon Ointment. Rosin, 350; Yellow Wax, 150; Lard, 500.

Rosin Cerate is contained in Linimentum Terebinthinæ.

2. Ceratum Resinæ Compositum.—Compound Rosin Cerate. *Synonym.*—Deshler's Salve. Rosin, 225; Yellow Wax, 225; Prepared Suet, 300; Turpentine, 115; Linseed Oil, 135.

ACTION.

Antiseptic; mildly irritant.

USES.

Rosin cerate is a good dressing for indolent or unhealthy ulcers and wounds. The chief use of rosin is in plasters, which it renders adhesive and more or less stimulating.

TEREBINTHINA CANADENSIS.

CANADA TURPENTINE. *Synonyms.*—Canada Balsam. Balsam of Fir. A liquid oleoresin obtained from *Abies balsamea* (Linné) Miller (Fam. *Pinaceæ* or *Coniferæ*). *Habitat.*—Canada and Northern United States, west to Minnesota, and south along the mountains to Virginia.

CHARACTERS.—Viscid, pale yellowish or greenish-yellow, transparent; odor agreeable; taste terebinthinate, bitter and slightly acrid. When exposed to the air, it gradually dries, forming a transparent varnish. *Solubility.*—Completely in Ether, Chloroform or Benzene.

COMPOSITION.—(1) A volatile oil, 20 to 30 per cent. (2) Resin. (3) A bitter principle soluble in water.

Canada Turpentine is contained in Collodium Flexile.

ACTION.

The same as that of oil of turpentine.

USES.

Especially in chronic bronchitis.

SINAPIS.

1. **SINAPIS ALBA.**—White Mustard. The seed of *Sinapis alba* (Linné) (Fam. *Crucifera*). *Habitat.*—Asia and Southern Europe; cultivated.

CHARACTERS.—Subglobular, 1 to 2 mm. in diameter; testa yellowish, finely pitted; embyro yellowish, oily, with a curved hypocotyl and two complete cotyledons; inodorous; taste mildly pungent and acrid.

COMPOSITION.—The chief constituents are—(1) A bland fixed oil, 20 to 25 per cent. (2) *Sinalbin*, $C_{30}H_{44}N_2S_2O_{16}$, and *Myrosin;* the latter is an Enzyme, and in contact with water converts *Sinalbin*, which is a

Glucoside, into a fixed pungent body, very acrid, called *Acrinyl Sulphocyanide*, C_7H_7ONCS, Glucose, and *Sinapine Sulphate*, $C_{16}H_{23}NO_5H_2SO_4$.

IMPURITY.—Starch.

Dose (emetic), **8 gm. (120 gr.).**

2. SINAPIS NIGRA.—Black Mustard. The seed of *Barssica nigra* (Linné) Koch (Fam. *Cruciferæ*). *Habitat.*—Asia and Southern Europe; cultivated.

CHARACTERS.—Subglobular, about 1.2 mm. in diameter; testa deep red brown, sometimes with a grayish tinge, finely pitted; embryo greenish-yellow, oily, with a curved hypocotyl and two conduplicate cotyledons; odor, while dry, slight; on moistening, powerfully irritating; taste strongly pungent and acrid.

COMPOSITION.—The chief constituents are—(1) The same fixed oil as the white seeds, about 35 per cent. (2) *Sinigrin* (which is Potassium Myronate, $C_{10}H_{18}KO_{10}NS_2$, a potassium salt of myronic acid, which is a crystalline glucoside) and *Myrosin*, an enzyme which on contact with water converts *Sinigrin* into Glucose, Potossium Sulphate, and the official volatile Oil of Mustard (*see* below), consisting almost entirely of *Allyl Iso-thiocyanate*. The volatile oil is very pungent and highly volatile, and its development on the addition of water explains the pungency of ordinary mustard.

IMPURITY.—Starch.

Dose (emetic), **8 gm. (120 gr).**

Resembling black mustard seeds.—Colchicum seeds, which are larger and lighter.

Preparation.

Charta Sinapis.—Mustard Paper. Black Mustard, 100. Percolate the Mustard with a sufficient quantity of Petroleum Benzin. Remove the powder and dry; add this to the solution: Rubber, 10, Petroleum Benzin, 100, and Carbon Disulphide, 100; and with a brush apply to one side of a piece of rather thick, well-sized paper (completely covering it), and allow the surface to dry.

3. OLEUM SINAPIS VOLATILE.—Volatile Oil of Mustard. A volatile oil obtained from Black Mustard (freed from its fatty oil) by maceration with water and subsequent distillation, yielding, when assayed, not less than 92 per cent. of Allyl Iso-thiocyanate ($CSNC_3H_5 = 98.40$).

CHARACTERS.—A colorless or pale yellow, limpid, and strongly refractive liquid, having a very pungent and acrid odor. *Great caution should be exercized when smelling this oil;* it should not be tasted without being highly diluted. Sp. gr., 1.013 to 1.020. *Solubility.*—Miscible with Alcohol in all proportions, forming a clear solution.

IMPURITIES.—Alcohol, chloroform, petroleum, carbon disulphide, phenols, fatty oils.

Dose, 0.008 c.c. (⅛ m).

ACTION.

Externally, a rubefacient, counter-irritant, and nervous stimulant; the stimulation of the sensory nerves is followed by their paralysis, in consequence of which there results a local loss of sensibility. If the application is sufficiently prolonged, it produces vesication, which is more severe and painful than that caused by cantharides. Internally, mustard is irritant and a non-depressant emetic.

USES.

Mustard plasters and papers are used to relieve gastralgia, neuralgia and pain in chest affections, lumbago, and a great variety of other conditions; a mild, equable counter-irritant effect may be maintained for hours by adding a small quantity of mustard to flaxseed poultices; hot mustard foot-baths and sitz-baths are employed in incipient colds and various febrile conditions, and to promote the menstrual flow. Internally, principally as an emetic (given in lukewarm water); amenorrhœa; hiccough; chronic bronchial and gastric catarrh.

OLEUM CAJUPUTI.

OIL OF CAJUPUT.—A volatile oil distilled from the fresh leaves and twigs of *Melaleuca Leucadendron* Linné (Fam. *Myrtaceæ*), yielding, when assayed, not less than 55 per cent., by volume, of Cineol. *Habitat.*—East Indian Islands.

CHARACTERS.—A thin, colorless or greenish liquid, having a peculiar, agreeable, distinctly camphoraceous odor, and an aromatic, slightly bitter taste. Sp. gr., 0.915 to 0.925. *Solubility.*—Readily in Alcohol.

COMPOSITION.—The chief constituents are—(1) *Cajuputol*, $C_{10}H_{18}O$; (67 per cent.) said to be identical with *Cineol*, and is isomeric with *Eucalyptol*. (2) *Terpineol*, $C_{10}H_{18}O$, and (3) Several terpenes—$C_{10}H_{16}$ (cajuputene) and $C_{15}H_{24}$.

IMPURITY.—Copper.

Dose, 0.5 c.c. (8 m).

ACTION.

Antiseptic and antiparasitic; externally, at first rubefacient and irritant, and later anæsthetic.

USES.

Externally, muscular rheumatism; chilblains; nervous headaches; chronic ns of the joints and periosteum; skin nic eczema, psoriasis and rosacea; pa scabies and tinea. Internally, flatul ctions of the stomach and bowels; ne ing; hiccough; dysmenorrhœa; chron is and bronchitis; catarrh of the bladder, r skin diseases; as a vermifuge.

EUCALYPTUS.

EUCALYPTUS.—The dried leaves of *Eucalyptus globulus* Labillardière (Fam. *Myrtaceæ*), collected from the older parts of the tree. *Habitat.*—Australia; cultivated in subtropical countries.

CHARACTERS.—Petiole twisted, 2 to 3 cm. long; blade lanceolately scythe-shaped, from 15 to 30 cm. long, 2 to 4 cm. broad, tapering above, rounded or very obliquely contracted at the oblique base, coriaceous, pale green, pellucid-punctate; venation inconspicuous, anastomosing near the entire margin; odor aromatic and somewhat camphoraceous; taste aromatic, bitter and cooling.

COMPOSITION.—(1) A volatile oil (*see* below); (2) Cerylic Alcohol; (3) A crystallizable Fatty Acid; (4) A crystallizable Resin.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Eucalypti.—Fluidextract of Eucalyptus. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 2 c.c. (30 ♏).

OLEUM EUCALYPTI.—Oil of Eucalyptus. A volatile oil distilled from the fresh leaves of Eucalyptus, rectified by steam distillation, and yielding, when assayed, no less than 50 per cent., by volume, of Cineol (Eucalyptol).

CHARACTERS.—A colorless or pale yellow liquid, having a characteristic,

›raceous odor and a pungent, spicy, and cooling
25. *Solubility.*—In all proportions in Alcohol.
:f constituents are—(1) *Eucalyptol*, $C_{10}H_{18}O$,
); (2) *Cymene*, $C_{10}H_{14}$; (3) *Eucalyptene*, $C_{10}H_{16}$;

›ils containing much phellandrene.
s, mineral acids, metallic salts.

/ptol. $C_{10}H_{18}O = 152.98$. An organic oxide
e volatile oil of *Eucalyptus globulus* and from

ation of Eucalpytus leaves, crude Eucalyptol
ınd 178° C. (338° and 352.4° F.), and is purified
ıstic Potash or Calcium Chloride.
·less liquid, having a characteristic, aromatic,
:eous odor, and a pungent, spicy, and cooling
21 to 0.923. *Solubility.*—In all proportions in

›il of eucalyptus, and other volatile oils.

Unofficial Preparation.

ıi. — Eucalyptus Gum. *Synonym.* — Red
:d exudation from the bark of *Eucalyptus*
ıceæ) and from other species. *Habitat.*—

nspissated secretion forming semi-translucent
ains or small masses. Tough and difficult
to the teeth when chewed. Taste very
n water. *Resembling Eucalyptus Gum.*—
and feebly soluble in water.
Composition. The chief constituents are—(1) *Kinotannic Acid.* (2) *Catechin.* (3) *Pyrocatechin.*

Dose, .12 to .60 gm.; 2 to 10 gr. in powder, or in an aqueous solution or made into a pill with mucilage of Acacia.

Action.

Antiseptic; disinfectant; rubefacient; stomachic; carminative; large doses cause severe gastro-intestinal irritation. By small doses the heart's action is stimulated and a rise in blood-pressure is produced, but large doses depress the heart and cause

a fall of blood-pressure, with great muscular weakness and lowered temperature. It restricts the movements of the white blood-corpuscles. Stimulation of the central nervous system is only very transient, and is followed by marked depression. Toxic doses paralyze the respiratory centre in the medulla. Eucalyptus has been thought by some to have slight antiperiodic properties and also cause contraction of the spleen to a limited extent. It is somewhat irritant at the points of elimination, and therefore has more or less action as a diaphoretic, expectorant and diuretic, and as a stimulant to the genito-urinary tract. Eucalyptus gum is powerfully astringent.

Uses.

Locally, wounds; indolent or unhealthy ulcers; as a counter-irritant in affections of the chest and of the joints; diphtheria; pharyngitis; tonsillitis; cancer of the rectum or uterus; bromidrosis; alopecia; chronic eczema. By inhalation, ozæna; diphtheria; bronchitis with fetid expectoration; phthicis; gangrene of the lungs. Internally, atonic dyspepsia; chronic gastric and intestinal catarrh; vomiting and indigestion caused by sarcinæ; convalescence from acute diseases; hysteria; neurasthenia; headaches; cerebral anæmia; subacute and chronic catarrhal affections of the bronchial mucous membrane and that of the genito-urinary tract; malarial poisoning and cachectic conditions generally. Eucalyptus gum is used internally for diarrhœa and locally for epistaxis, throat troubles, hæmorrhoids, etc.

OLEUM ROSMARINI.

OIL OF ROSEMARY.—A volatile oil distilled from the fresh flowering tops of *Rosmarinus officinalis* Linné (Fam. *Labiatæ*), yielding, when assayed, not less than 2.5 per cent. of Ester, calculated as Bornyl Acetate, and not less than 10 per cent. of total Borneol. *Habitat.*—Base of the Mediterranean; cultivated.

Characters.—A colorless or pale yellow, limpid liquid, having the characteristic pungent odor of Rosemary, and a warm, somewhat camphoraceous taste. Sp. gr., 0.894 to 0.912. *Solubility.*—In about one-half volume of 90 per cent. Alcohol.

COMPOSITION.—The chief constituents are—(1) The terpene, *Pinene*, $C_{10}H_{16}$, 80 per cent. (2) *Cineol*, $C_{10}H_{18}O$. (3) *Borneol*, $C_{10}H_{16}O$, an alcohol isomeric with Geraniol (*q. v.*). (4) *Linalool* (*see* p. 373). (5) *Menthol* (*see* p. 246).

Dose, 0.2 c.c. (3 ♏).

Oil of Rosemary is contained in Linimentum Saponis and Tinctura Lavandulæ Compositæ.

ACTION.

Like that of other similar volatile oils.

USES.

As a stimulant in lotions, liniments and ointments; alopecia; facial acne; scabies; pediculosis; to give a pleasant scent to preparations for external use. It is rarely used internally.

ARNICA.

ARNICA.—The dried flower heads of *Arnica montana* Linné (Fam. *Compositæ*). *Synonym.*—Leopardsbane. *Habitat.*—Europe and Northern Asia; in mountainous districts.

CHARACTERS.—Subglobular, about 2 cm. long; involucre campanulate-turbinate; bracts in 1 to 2 ranks, oblong, dark green, pubescent; receptacle slightly convex, deeply pitted, densely short-hairy; rays about 16, bright yellow, the ligulate portion 2 to 2.5 cm. long, nearly 6 mm. broad, 3-toothed, 7- to 9-nerved, pistillate; disk flowers perfect, 5-toothed, of a deeper yellow, their akenes nearly 6 mm. long, slender, tapering sharply to the base, flattened, 5-ribbed, pubescent, the pappus nearly a half longer than the akene, of a single circle of nearly white barbellate bristles; odor characteristic and agreeable; taste bitter.

COMPOSITION.—(1) *Arnicin*, an amorphous, yellow, acrid, bitter principle; easily soluble in Alcohol and Ether. (2) Volatile Oil. (3) Caprylic and Capronic Acids. (4) Resin. (5) Tannic acid.

Dose, 1 gm. (15 gr.).

Preparation.

Tinctura Arnicæ.—Tincture of Arnica. Arnica, 200; by percolation with Diluted Alcohol to 1000.

Dose, 1 c.c. (15 ♏).

ACTION.

The same as that of the volatile oils in general.

Uses.

Locally, myalgia; sprains, bruises and external inflammations generally; it should not be applied if the skin is broken. Internally, as a stomachic, carminative and reflex stimulant.

MEZEREUM.

MEZERE The dried bark of *Daphne Mezereum* Li pecies of *Daphne* (Fam. *Thymeleaceæ*). *Ha* as regions, eastward to Siberia; spontaneous l.

CHARACTE tough bands, the edges fringed with partly c face yellowish- or reddish-brown, obliquely stri s lenticels and occasional brownish-black fruit-l rface yellowish-green or whitish, satiny-lustrous, finely striate; fracture tough, fibrous, the periderm readily separable from the yellowish-green cortex, inner bark lamellated; odor slight; taste very acrid.

COMPOSITION.—The chief constituents are—(1) *Mezerein*, a soft, acrid resin. (2) An acrid, rubefacient, volatile oil. (3) *Daphnin*, $C_{15}H_{16}O_9 + 2H_2O$, a bitter glucoside in fine needles or rectangular plates. (4) *Coccogin*, $C_{20}H_{22}O_8$, a bitter principle.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

Mezereum is contained in Fluidextractum Sarsaparillæ Compositum.

Preparation.

Fluidextractum Mezerei.—Fluidextract of Mezereum. By maceration and percolation with Alcohol, and evaporation.

Action.

The same as that of volatile oils generally. Externally it is a rubefacient and vesicant; internally, a gastric stimulant, producing, in large doses, vomiting and diarrhœa.

Uses.

As a counter-irritant, and occasionally to keep open an issue. In the mouth it is employed to relieve toothache and as a sialogogue. Internally, almost exclusively in the compound fluidextract of sarsaparilla.

GROUP XI.—The Demulcent Substances.

Olive Oil, Cotton Seed Oil, Chondrus, Glycerin, Althæa, Sweet Almond, Tragacanth, Acacia, Elm, Glycyrrhiza, Linseed, Sugar, Malt, Starch, Sweet Orange.

OLEUM OLIVÆ.

OLIVE OIL. *Synonym.*—Sweet Oil. A fixed oil expressed from the ripe fruit of *Olea europæa* Linné (Fam. *Oleaceæ*). *Habitat.*—Asia and Southern Europe; cultivated.

CHARACTERS.—A pale yellow, or light greenish-yellow, oily liquid, having a slight, peculiar odor, and a nut-like, oleaginous taste, with a faintly acrid after taste. Sp. gr., 0.910 to 0.915. *Solubility.*—Very sparingly in Alcohol; readily in Ether, Chloroform, or Carbon Disulphide.

COMPOSITION.—The three constituents are—(1) *Olein*, 72 per cent., a fluid oil, a compound of Oleic Acid and Glyceryl, thus: $C_3H_5(C_{18}H_{33}O_2)_3$. (2) *Palmitin*, 28 per cent., a solid oil, a compound of Palmitic Acid, and Glyceryl, $C_3H_5(C_{16}H_{31}O_2)_3$. The formula for Oleic Acid is $HC_{18}H_{33}O_2$; and for Palmitic, $HC_{16}H_{31}O_2$. (3) *Arachin*, $C_{20}H_{40}O_2$.

IMPURITIES.—Cotton seed and other oils, especially sesame.

Dose, 30 c.c. (1 fl. oz.).

Olive Oil is contained in all the official Oleates, except Oleatum Quininæ, and in Unguentum Diachylon.

ACTION.

Emollient; lubricant; demulcent; nutritive; mildly laxative. Ingested, it is, like other oils, partly emulsified and partly saponified in the intestine, and the olein is finally deposited in the body as fat.

USES.

Externally, to facilitate the rubbing of joints and other parts; to remove crusts in cutaneous diseases; as a protective and emollient in burns and acute inflammatory affections; for inunctions in scarlatina and other exanthemata. Internally, irritant poisoning; as a laxative, especially for infants and in hæmorrhoids and fissure of the anus; biliary calculi; obstructive jaundice. It is frequently used in the form of an enema, and it has been injected into the pleural sac in dry pleurisy.

ACIDUM OLEICUM.

OLEIC ACID.—$HC_{18}H_{33}O_2 = 280.14$.

SOURCE.—A monobasic organic acid, prepared in a sufficiently pure condition by cooling commercial Oleic Acid to about 5° C. (41° F.), then separating and preserving the liquid portion. In case that it is obtained from Olive Oil the reaction is $C_3H_5(C_{18}H_{33}O_2)_3 + 3H_2O = 3HC_{18}H_{33}O_2 + C_3H_5(OH_3)$ (C

CHARACTERS.— -yellow, oily liquid, having a peculiar, lard-li ; darker and absorbing Oxygen on exposure to When cooled to from 4° to 9° C. (39.2° to 48.2° nd, on further cooling, congeals in a whitish, s ble in water; soluble in Alcohol, Chloroform, E nd fixed and volatile oils.

IMPURITIES. containing stearic and palmitic acids or fixed o

Oleic Acid is used to prepare Oleatum Atropinæ, Cocainæ, Hydrargyri, Quininæ and Veratrinæ. There is some doubt whether the pharmacopœial oleates are chemical combinations or simple solutions.

ACTION.

It is unirritating, and penetrates the skin more readily than fats and oils.

USES.

Pharmaceutically in the preparation of oleates and also in plasters and soaps. The oleates are used for the purpose of securing the absorption of drugs through the skin.

SAPO.

SOAP. (Oleate of Sodium, $NaC_{18}H_{33}O_2$.) *Synonyms.*—White Castile Soap, Hard Soap.

SOURCE.—Soap is prepared from Sodium Hydroxide and Olive Oil. $C_3H_5(C_{18}H_{33}O_2)_3 + 3NaOH = 2NaC_{18}H_{33}O_2$ (Hard Soap) $+ C_3H_5(OH)_3$ (Glycerin).

CHARACTERS.—A white or whitish solid, hard, yet easily cut when fresh, having a faint, peculiar odor free from rancidity, a disagreeable, alkaline taste, and an alkaline reaction. *Solubility.*—Soluble in water and in Alcohol, more readily with the aid of heat.

IMPURITIES.—Animal fats, sodium carbonate, silica, metallic impurities.

Soap is contained in Emplastrum Plumbi, Extractum Colocynthidis Compositum, Pilulæ Aloes, Pilulæ Asafœtidæ, and Pilulæ Opii.

Preparations.

1. Emplastrum Saponis.—Soap Plaster. Soap, 10; Lead Plaster, 90; by solution in Water and evaporation.

2. Linimentum Saponis.—Soap Liniment. *Synonym.*—Opodeldoc. Soap, 60; Camphor, 45; Oil of Rosemary, 10; Alcohol, 725; Water to 1000.

Soap Liniment is contained in Linimentum Chloroformi.

SAPO MOLLIS.

SOFT SOAP. (Oleate of Potassium.) *Synonym.*—Green Soap.

Source.—By heating Linseed Oil, 400; adding to this Potassium Hydroxide, 95; dissolved in Water, 450; and Alcohol, 40; until the mixture is soluble in boiling Water without the separation of oily drops.

CHARACTERS.—A soft, unctuous, yellowish-brown mass, having a characteristic odor and an alkaline taste. *Solubility.*—In hot water to a nearly clear liquid; also in hot Alcohol without leaving more than 3 per cent. of insoluble residue.

Preparation.

Linimentum Saponis Mollis.—Liniment of Soft Soap. *Synonym.*—Tincture of Green Soap. Soft Soap, 650; Oil of Lavender, 20; Alcohol to 1000. By filtration.

ACTION.

Externally, detergent and discutient, combining with the fat of the excretions and removing, along with this, epithelial scales, bacteria and dirt, or other foreign matter; internally, laxative and antacid.

USES.

For cleansing purposes in medicine and surgery; as a vehicle for remedies in skin diseases; by enema or suppository to evacuate the bowels. Internally, as an aid to emetics; in acidity of the stomach. Soap plaster is used for bed-sores and soap liniment for sprains, stiffness of the joints or muscles, etc., and as a basis for extemporaneous liniment prescriptions. Soft soap is employed in the treatment of many skin diseases.

OLEUM GOSSYPII SEMINIS.

COTTON SEED OIL.—A fixed oil expressed from the seed of *Gossypium herbaceum* Linné, or of other species of *Gossypium* (Fam. *Malvaceæ*), and subsequently purified. *Habitat.*—Asia and Africa; cultivated.

CHARACTERS.—A pale yellow, oily liquid, without odor, and having a bland, nut-like taste. Sp. gr., 0.915 to 0.921. *Solubility.*—Very sparingly in Alcohol, but rm or Carbon Disulphide.

COMPOSITION.— . (3) Coloring matter.

Cotton Seed m Ammoniæ and Linimentum Camphoræ.

Dose, 16 c

Nutrient;

As a bland, nutritious oil, and in liniments.

CHONDRUS.

CHONDRUS. *Synonyms.*—Irish Moss. Carragheen. The dried plant of *Chondrus crispus* (Linné) Lyngbye (Fam. *Gigartinaceæ*). *Habitat.*—Atlantic Ocean.

CHARACTERS.—Usually in light yellow or yellowish-white matted masses; the plant consisting of a slender, somewhat flattened base about one-half the length of the entire frond, which, after repeated forking, terminates in a number of palmately branching, somewhat enlarged, commonly emarginate or two-lobed segments; translucent, sometimes with fruit bodies embedded near the apex of the segments; somewhat cartilaginous; having a slight sea-weed odor and a mucilaginous, somewhat saline taste.

COMPOSITION.—(1) Mucilaginous Compounds, 90 per cent. (2) Albuminoids. (3) Chlorides, sulphates and phosphates, with traces of bromides and iodides.

Dose (in decoction), **15 gm. (4 dr.).**

ACTION.

Demulcent; nutrient.

USES.

Pulmonary affections; diarrhœa; dysentery; genito-urinary disorders; also used in making preparations of bone marrow.

GLYCERINUM.

GLYCERIN.—Glycerol.—A liquid obtained by the decomposition of vegetable or animal fats, or fixed oils (*see* pp. 3 and 403), and containing

not less than 95 per cent. of absolute Glycerol, a triatomic alcohol, $CH_2OH \cdot CHOH \cdot CH_2OH = 91.37$.

CHARACTERS.—A clear, colorless liquid, of a thick, syrupy consistence, smooth to the touch, odorless, sweet to the taste, and producing a sensation of warmth upon the mouth and lips. When exposed to the air, it absorbs moisture. Sp. gr., not less than 1.246. *Solubility.*—In all proportions in water or Alcohol; also soluble in a mixture of 3 parts of Alcohol and 1 part of Ether; insoluble in Ether, Chloroform, Carbon Disulphide, Petroleum Benzin, Benzene, and fixed and volatile oils.

Dose, 4 c.c. (1 fl. dr.).

Glycerin is contained in Gelatinum Glycerinatum, Liquor Ferri et Ammonii Acetatis, Massa Hydrargyri, Mucilago Tragacanthæ, Pilulæ Phosphori, in the Glycerita, and in many Extracta, Fluidextracta, Syrupi and Tincturæ.

Preparations.

1. **Glyceritum Acidi Tannici.**—Glycerite of Tannic Acid. Tannic Acid, 20; Glycerin, 80.

Dose, 2 c.c. (30 ♏).

2. **Glyceritum Amyli.**—Glycerite of Starch. Starch, 10; Water, 10; Glycerin, 80.

3. **Glyceritum Boroglycerini.**—Glycerite of Boroglycerin. Boric Acid, 310; Glycerin to 1000.

4. **Glyceritum Ferri, Quininæ et Strychninæ Phosphatum.**—Glycerite of the Phosphates of Iron, Quinine and Strychnine. Soluble Ferric Phosphate, 80; Quinine, 104; Strychnine, 0.8; Phosphoric Acid, 200; Glycerin, 500; water, to 1000.

Dose, 1 c.c. (15 ♏).

5. **Glyceritum Hydrastis.**—Glycerite of Hydrastis. Hydrastis, 1000, by percolation and maceration with Alcohol; distil off the Alcohol, add water, filter, and to the filtrate add Glycerin, 500.

Dose, 2 c.c. (30 ♏).

6. **Glyceritum Phenolis.**—Glycerite of Phenol. Liquefied Phenol, 20; Glycerin, 80.

Dose, 0.3 c.c. (5 ♏).

7. **Suppositoria Glycerini.**—Suppositories of Glycerin. Glycerin, 30; Monohydrated Sodium Carbonate, 0.5; Stearic Acid, 2; Water, 5. By solution with heat, pouring into ten moulds. When cold they should be placed in tightly stoppered glass vessels. Each suppository contains 3 gm. (45 gr.) of Glycerin.

ACTION.

Antiseptic; emollient; demulcent; nutrient; in large doses it is a mild gastro-intestinal irritant, and in animals may cause intense pulmonary, renal and intestinal congestion, convulsions and death.

Very largely ent and vehicle for active medicaments; tive; internally, for trichiniasis, hepa , vomiting of pregnancy, and as a vel

ALTHÆA. *Synonym.*—Marshmallow. The dried root of *Althæa officinalis* Linné (Fam. *Malvaceæ*), collected from plants of the second year's growth, and deprived of the periderm. *Habitat.*—Europe, Western and Northern Asia; naturalized in the Eastern United States and in Australia, in salt marshes; cultivated in Europe.

CHARACTERS.—Slenderly tapering, 15 to 30 cm. long, rarely exceeding 20 mm. in diameter; externally whitish, traversed longitudinally by several broad, shallow furrows, and covered with loosened bast-fibres; fracture of bark fibrous, of wood short and granular; internally yellowish-white; odor faint; taste sweetish, mucilaginous. The powder contains rosette-shaped crystals of Calcium Oxalate, about 0.025 mm. in diameter, and ellipsoidal starch grains from 0.010 to 0.020 mm. in diameter.

Resembling Althæa.—Young and peeled Belladonna roots, but these have no hair-like bast-fibres upon the surface.

COMPOSITION.—(1) Asparagin (1 per cent.) $C_4H_8N_2O_3 + H_2O$. *Synonym.*—Althein. Colorless, neutral, transparent, lustrous crystals. Sp. gr., 1.520. Soluble in water (47 parts), acids and alkalies; by the latter it is converted into Ammonia and organic acid. Dose, .12 to .30 gm.; 2 to 5 gr. It is principally used for making Asparagin Mercury, which is employed hypodermatically. (2) *Bassorin*, a mucilage, 35 per cent. (3) Sugar, 8 per cent. (4) Pectin, 10 per cent.

Althæa is used in Massa Hydrargyri, Pilulæ Ferri Carbonatis, and Pilulæ Phosphori.

ACTION.

Demulcent; emollient; slightly nutritious.

Uses.

As a demulcent for irritation and inflammation of mucous membranes.

AMYGDALA DULCIS.—Sweet Almond (*see* p. 274).

TRAGACANTHA.

TRAGACANTH.—A gummy exudation from *Astragalus gummifer* Labillardière, and from other species of *Astragalus* (Fam. *Leguminosæ*). *Habitat.*—Western Asia.

Characters.—In ribbon-shaped bands varying in size and from 1 to 3 mm. thick, or in irregular pieces of the same, long and linear, straight or spirally twisted; externally whitish, marked by more or less pronounced longitudinal or excentric lines or ridges; translucent, horny, fracture short, tough, rendered more easily pulverizable by a heat of 50° C. (122° F.). On treating Tragacanth with 50 parts of water, it swells and gradually forms a cloudy, gelatinous mass, which, on warming with Solution of Sodium Hydroxide on a water-bath, becomes yellow and is tinged blue on the addition of Iodine Test Solution; the addition of Alcohol to the fluid portion causes a precipitate, but the liquid is not colored blue by Iodine T. S. *Resembling Tragacanth.*—Squill, which is thicker and opaque.

Composition.—The chief constituents are—(1) *Bassorin*, $CH_{10}O_5$, a gum 33 per cent., only slightly soluble in water, unfermentable. (2) *Arabin*, 53 per cent., which resembles, but is not identical with the Arabin of Acacia. Precipitated by lead acetate. (3) A little starch.

Impurities.—Other gums.

Incompatibles.—Alcohol, copper sulphate, ferrous sulphate, lead acetate.

Tragacanth is contained in Pilulæ Ferri Carbonatis and in several Trochisci.

Preparation.

Mucilago Tragacanthæ.—Mucilage of Tragacanth. Tragacanth, 6; Glycerin, 16; Water to 100. By heating, maceration and straining.

Dose, 16 c.c. (4 fl. dr.).

Action.

Demulcent; slightly nutritive.

Uses.

Chiefly to suspend insoluble powders; also as a demulcent in pharyngitis, gastritis and intestinal inflammation, and externally as a protective.

ACACIA.

ACACIA. *Synonym.*—Gum Arabic. A gummy exudation from *Acacia Senegal* Willdenow and other species of *Acacia* (Fam. *Leguminosæ*). *Habitat.*—Eastern Africa, principally Kordofan; Western Africa, near the river Senegal.

CHARACTERS.—In roundish tears of various sizes, or broken into angular fragments, whitish or yellowish-white, translucent; very brittle, with a glass-like, sometimes iridescent, fracture; nearly inodorous; taste insipid, mucilaginous. *Solubility.*—Insoluble in Alcohol; slowly and completely soluble in water, forming an odorless, mucilaginous liquid with an acid reaction.

COMPOSITION.—The chief constituent is *Arabin*, $C_{12}H_{22}O_{11}$; combined with Calcium, Magnesium and Potassium. This is not affected by Lead Acetate.

IMPURITIES.—Starch, dextrin.

INCOMPATIBLES.—Alcohol, ammonia, ether, ferric salts, lead subacetate, mineral acids, potassium tartrates, syrup of squill.

Acacia is contained in Emulsum Amygdalæ, Emulsum Olei Morrhuæ, Emulsum Olei Morrhuæ cum Hypophosphitus, Mistura Glycyrrhizæ Composita, Pulvis Cretæ Compositus, and in some Pilulæ and Trochisci.

Preparations.

1. **Mucilago Acaciæ.**—Mucilage of Acacia. Acacia, 340; Lime Water, 330; Water, to 1000.

Dose, 16 c.c. (4 fl. dr.).

2. **Syrupus Acaciæ.**—Syrup of Acacia. Acacia, 100; Sugar, 800; Distilled Water to 1000. By solution with the aid of heat, and straining.

ACTION.

Demulcent.

USES.

Inflammatory conditions of the bronchial, gastric, vesical and intestinal mucous membrane; irritant poisoning; as a vehicle; as an external protective for burns, excoriations and ulcers.

ULMUS.

ELM. *Synonym.*—Slippery Elm Bark. The dried bark of *Ulmus fulva* Michaux (Fam. *Ulmaceæ*), deprived of its periderm. *Habitat.*—North America, west to Louisiana and Nebraska, in woods.

CHARACTERS.—In flat pieces, varying in length and width, 3 to 4 mm. thick; outer surface light brown, with occasional dark brown patches of the

periderm; inner surface yellowish-brown; fracture fibrous and somewhat mealy; odor slight, but distinct; taste mucilaginous.

COMPOSITION.—It contains—(1) Mucilage. (2) Some Tannic Acid.

Preparation.

Mucilago Ulmi.—Mucilage of Elm. Elm, 6; water, 100. By digestion in a covered vessel, on a water-bath, and straining.
Dose, 16 c.c. (4 fl. dr.).

ACTION.

Demulcent; tonic; nutritive; astringent.

USES.

Irritable conditions of the faucial and bronchial mucous membrane; dysentery, diarrhœa and diseases of the urinary passages. Locally it is used in the form of poultices, and it is lighter than flaxseed.

GLYCYRRHIZA.

GLYCYRRHIZA.—Licorice Root.—The dried rhizome and root of *Glycyrrhiza glabra* Linné (Spanish Licorice), or of *Glycyrrhiza glandulifera* Waldstein and Kittaibel (Russian Licorice) (Fam. *Leguminosæ*). *Habitat.*—Southern Europe and Western Asia; cultivated.

CHARACTERS.—*Spanish Licorice Root.*—Cylindrical, usually cut into pieces 14 to 20 cm. or more long; 5 to 15 mm. thick; longitudinally wrinkled, grayish-brown or dark-brown, pliable; fracture coarsely fibrous; internally tawny-yellow; bark 1 to 3 mm. thick; wood porous, in narrow wedges; odor slight; taste sweetish and slightly acrid.

Russian Licorice Root.—Somewhat tapering, frequently 1 m. or more in length, 1 to 5 cm. in diameter, deprived of the outer corky layer, when it is externally pale yellow; internally of a lighter yellow; wood rather soft, taste less sweet than that of the Spanish Licorice. Any blackened, knotty, bitter portions should be removed. *Resembling Licorice.*—Pyrethrum and Taraxacum, which are not sweet.

COMPOSITION.—The chief constituents are—(1) *Glycyrrhizin*, $C_{24}H_{36}O_9$, about 6 per cent., a yellow amorphous glucoside, probably in combination with Ammonia. With acids this yields a very bitter substance, *Glycyrrhetin*, and glucose. (2) *Asparagin*, about 3 per cent. (3) *Glycyramin*. (4) An acrid Resin. (5) Starch.

Dose, 2 gm. (30 gr.).

Glycyrrhiza is used in Fluidextractum Rhamni Purshianæ Aromaticum, Fluidextractum Sarsaparillæ Compositum, Massa Hydrargyri, Pilulæ Ferri

Iodidi, Pilulæ Laxativæ Compositæ, Pulvis Morphinæ Compositus, Tinctura Aloes, and Tinctura Aloes et Myrrhæ.

The peeled Russian variety is used to make Extractum Cimicifugæ, Euonymi, Leptandræ, Physostigmatis and Rhamni Purshianæ.

Licorice and its preparations are contained in many preparations, generally to cover their nauseous taste. They conceal very well that of Aloes, Cascara Sagrada, Ammonium Chloride. Hyoscyamus, Senega, Senna, Turpentine, and very ne Sulphate.

1. **Elixir** ir. Fluidextract of Glycyrrhiza, (Aromatic Elixir is prepared as Orange, 12; Syrup, 375; Purified T Water, each, a sufficient quantity to the Compound Spirit of Orange in Alcohol, to 250; addition of Syrup and Purified Talc, and filtering, with distilled Water to 1000.)

2. **Extractum Glycyrrhizæ.**—Extract of Glycyrrhiza. *Synonym.*—Extract of Licorice. This is the commercial extract.

CHARACTERS.—In flattened, cylindrical rolls, from 15 to 18 cm. long, and from 10 to 30 mm. thick; of a glossy, black color. It breaks with a sharp, conchoidal, shining fracture, and has a very sweet, peculiar taste. Not less than 60 per cent. of it should be soluble in cold water.

Dose, 1 gm. (15 gr.).

Extract of Glycyrrhiza is contained in Pilulæ Ferri Iodidi, Trocisci Ammonii Chloridi, Trochisci Cubebæ, and Trochisci Glycyrrhizæ et Opii.

3. **Extractum Glycyrrhizæ Purum.**—Pure Extract of Glycyrrhiza. Made from peeled Glycyrrhiza by maceration and percolation with Ammonia Water, Glycerin and water, and evaporation.

Dose, 1 gm. (15 gr.).

4. **Eluidextractum Glycyrrhizæ.**—Fluidextract of Glycyrrhiza. By maceration and percolation with Ammonia Water, Glycerin, Alcohol and water, and evaporation.

Dose, 2 c.c. (30 ♏).

Fluid extract of Glycyrrhiza is used to prepare Syrupus Sarsaparillæ Compositus.

5. **Glycyrrhizinum Ammoniatum.**—Ammoniated Glycyrrhizin.

SOURCE.—Glycyrrhiza, by maceration and percolation with

Water of Ammonia and Water; precipitation with Sulphuric Acid, solution with Water of Ammonia, and drying.

CHARACTERS.—Dark-brown or brownish-red scales, without odor, and having a very sweet taste. *Solubility.*—Readily in water and in Alcohol.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

6. Mistura Glycyrrhizæ Composita.—Compound Mixture of Glycyrrhiza. *Synonym.*—Brown Mixture. Pure Extract of Glycyrrhiza, 30; Syrup, 50; Acacia, 30; Camphorated Tincture of Opium, 120; Wine of Antimony, 60; Spirit of Nitrous Ether, 60; Water, to 1000.

Dose, 8 c.c. (2 fl. dr.).

7. Pulvis Glycyrrhizæ Composita.—Senna, 180; Glycyrrhiza, 236; Oil of Fennel, 4; Washed Sulphur, 80; Sugar, 500.

8. Trochisci Glycyrrhizæ et Opii.—Troches of Glycyrrhiza and Opium. Extract of Glycyrrhiza, 15; Powdered Opium, 0.5; Acacia, 12; Sugar, 20; Oil of Anise, 0.2; Water, to make 100 troches.

ACTION.

Demulcent; expectorant; laxative.

USES.

As a laxative (in the form of Compound Licorice Powder) and in irritable conditions of the mucous membrane of the air-passages, bladder and intestines.

LINUM.

LINSEED. Flaxseed.—The ripe seed of *Linum usitatissimum* Linné (Fam. *Linaceæ*). *Habitat.*—Levant and Southern Europe; cultivated and spontaneous in most temperate countries.

CHARACTERS.—Ovate or oblong-lanceolate, flattened, 4 or 5 mm. long, obliquely pointed at one end; externally chestnut-brown, very smooth and glossy, covered with a transparent mucilaginous, outer wall which swells in water; embryo whitish or greenish, with two large, plano-convex and oily cotylendons, embedded in a thin perisperm; odor slight; taste mucilaginous, oily.

Ground Linseed (Linseed Meal or Flaxseed Meal) should be recently prepared and free from unpleasant or rancid odor. It is a grayish-yellow powder containing brownish fragments, and when exhausted by Carbon Disulphide should yield not less than 30 per cent. of a fixed oil, all of which is saponifiable.

COMPOSITION.—(1) A viscid, fixed oil, 30 to 35 per cent. in the embryo. (2) Mucilage, 15 per cent. in the epithelium. (3) Proteids, 25 per cent. (4) *Amygdalin*, a minute quantity.

OLEUM LINI.—Linseed Oil. *Synonym.*—Oil of Flaxseed. A fixed oil expressed from Linseed. Linseed Oil which has been "boiled" should not be used.

CHARACTERS.—A yellowish, oily liquid, having a peculiar odor and a bland taste. When exposed to the air it gradually thickens, darkens in color, and acquires a strong odor and taste; if spread in a thin layer on glass and allowed to stand in a warm place, it is gradually converted into a hard, transparent resin. Sp. gr., 0.925 to 0.935. *Solubility.*—In about 10 parts of Absolute Alcohol, and in all proportions in Ether, Chloroform, Petroleum Benzin, Carbon Disulphide, and Oil of Turpentine.

COMPOSITION.—Its most characteristic principles are—(1) *Linolein.* (2) *Myristin.* (3) *Palmitin.* (4) Albumin, a large percentage, to which its drying properties are due.

IMPURITIES.—Free acid, rosin, rosin oils, mineral oils, and non-drying oils.

Dose, 30 c.c. (1 fl. oz.).

Linseed Oil is contained in Ceratum Resinæ Compositum, Linimentum Calcis, and Liquor Cresolis Compositus.

ACTION.

Demulcent; emollient; laxative; mildly diuretic.

USES.

Locally in poultices and in mucilage or infusion for various painful and inflammatory conditions; the oil is used in applications to burns and in laxative enemata. Internally, bronchitis, sore-throat, enteritis, dysentery, cystitis and various other affections of the mucous membranes.

SACCHARUM.

SUGAR. $C_{12}H_{22}O_{11} = 339.6$. *Synonyms.*—Cane Sugar. Sucrose. The refined Sugar obtained from *Saccharum officinarum* Linné, and from various species of varieties of *Sorghum* (Fam. *Gramineæ*); also from one or more varieties of *Beta vulgaris* Linné (Fam. *Chenopodiaceæ*). *Habitat.*—Southern Asia; cultivated in tropical and subtropical countries.

CHARACTERS.—White, dry, hard, distinctly crystalline granules, odorless, and having a purely sweet taste. Permanent in the air. *Solubility.*—In 0.46 part of water and 0.2 part of boiling water; in 137.2 parts of Alcohol

and 28 of boiling Alcohol; insoluble in Ether, Chloroform, or Carbon Disulphide.

IMPURITIES.—Glucose, inverted sugar, insoluble salts, ultramarine, Prussian blue, etc.

Preparation.

Syrupus.—Syrup. Sugar, 850; Distilled Water, by solution with heat, and straining to 1000.

Syrup thus prepared has a Sp. gr. of about 1.313. It is used for compound syrups.

ACTION.

Nutrient; demulcent; antiseptic; antiputrefactive, but not antifermentative.

USES.

As a sweetening and preservative agent; molasses and brown sugar are employed in domestic medicine as mild laxatives.

Unofficial Preparation.

Levulosum.—Levulose. $C_6H_{12}O_6$. *Synonyms.*—Fruit Sugar. Fructose. An isomeric form of glucose, found in honey and in the juice of fruits. It is usually a colorless uncrystallizable syrup, nearly as sweet as Cane Sugar and soluble in water. It may be produced from Inulin by diluted acids. With nascent Hydrogen it yields Mannit, and with Nitric Acid it is oxidized into Succinic, Acetic and Oxalic Acids. Under the name of *Diabetin* it is used as a substitute for cane sugar in the treatment of diabetes.

MALTUM.

MALT. *Synonym.*—Byne. The grain of barley, *Hordeum distichon* Linné (Fam. *Gramineæ*), partially germinated artificially, and then dried.

CHARACTERS.—Yellowish or amber-colored grains, shading to brown; crisp when fractured; the interior surface whitish, or tinged with brown if the grains have been heated sufficiently to cause caramelization. It should have an agreeable, characteristic odor and a sweet taste due to the conversion of the starch in the seed into Maltose. Malt should float on cold water.

COMPOSITION.—It contains the ferment Diastase, which can convert starch into Dextrin and Maltose. Thus $10(C_6H_{10}O_5) + 4H_2O = 4C_{12}H_{22}O_{11}$, Maltose $+ (C_{12}H_{20}O_{10})$, Dextrin.

EXTRACTUM MALTI.—Extract of Malt. By maceration, dilution with warm water, digestion at a temperature not exceeding 55° C. (131°

F.), straining and evaporation by means of a water-bath or vacuum apparatus.

CHARACTERS.—It is a sweet, thick, brownish liquid, like honey, forming an emulsion with oils. Most specimens are too viscid for prolonged use.

COMPOSITION.—This varies very much. The chief constituent is *Maltose* ($C_{12}H_{22}O_{11}$); there is also some *Dextrin* ($C_{12}H_{20}O_{10}$), some Diastase (unless destroyed by boiling), Albumin, Inorganic salts contained in barley, and sometimes Alcoh

Dose, 16 c.c.

Demulcent;

In all condi ble to give a readily assimilable carbohyd indicated in convalescence from acute disorders, in the derangements of the system caused by chronic disease, and in cases of wasting and of poor digestion.

Unofficial Preparation.

Taka-Diastasum. — Taka-Diastase. A ferment formed by the action of a fungus (*Eurotium oryzæ*, of the aspergillus family) upon steamed rice. It is a yellowish-white, highly hygroscopic powder, nearly tasteless, and freely soluble in water. Its action resembles very closely that of saliva, and it is capable of digesting over one hundred times its own weight of starch. It ceases to act in the gastric juice as soon as the acidity exceeds 0.1 per cent.

Dose, .30 to .60 gm.; 5 to 10 gr.

AMYLUM.

STARCH.—Corn Starch.—The starch grains obtained from the fruit of *Zea Mays* Linné (Fam. *Gramineæ*). *Habitat.*—Tropical Asia and Africa; cultivated in tropical and subtropical countries.

CHARACTERS.—In fine powder or irregular, angular white masses, consisting of somewhat spherical, but usually polygonal, grains, about 0.010 to 0.025 mm. in diameter, with a lenticular, circular, or triangular central fissure; inodorous and tasteless; insoluble in Alcohol or cold water; forming a whitish jelly when boiled with water, which, when cool, gives a deep blue color with Iodine Test Solution.

COMPOSITION.—Its ultimate composition is $C_6H_{10}O_5$, but it consists of a mixture of various modifications of Starch-cellulose and Starch-granulose.

Preparation.

Glyceritum Amyli.—*See* Glycerin, p. 406.

Action.

Demulcent and nutritive; in the animal economy starch undergoes digestion by ptyalin, pancreatin and the secretion of the intestinal glands, which convert it into soluble dextrin and then into grape-sugar, in which form it passes into the blood.

Uses.

Employed principally on account of its mechanical properties, which make it a good basis for dusting powders and insufflations; mucilage of starch is a convenient basis for enemata.

AMYGDALA DULCIS.—Sweet Orange (*see* p. 274).

GROUP XII.—Drugs Acting on Metabolism.

Guaiac, Xanthoxylum, Sarsaparilla, Stillingia, Lappa, Sassafras, Berberis, Calendula, Scutellaria.

GUAIACUM.

GUAIAC. The resin of the wood of *Guaiacum officinale* Linné, or of *Guaiacum sanctum* Linné (Fam. *Zygophyllaceæ*).

Source.—By melting the resin of the heartwood by fire.

Characters.—Usually in irregular masses, externally greenish-gray brown; brittle, the fracture having a glassy lustre; in recent Guaiac yellowish-green or reddish-brown; transparent in thin splinters; fusible; odor balsamic; taste somewhat acrid. The powder is grayish, turning green on exposure to air. Not more than 15 per cent. of Guaiac is insoluble in Alcohol, and the alcoholic solution becomes blue on the addition of Tincture of Ferric Chloride. Guaiacum Resin on dry distillation yields Creosol and *Guaiacol*, also found in Creosote (*see* p. 290). *Resembling Guaiacum.*—Myrrh, Scammony, Benzoin, Aloes, and Rosin, but these have no greenish tinge.

Composition.—The chief constituents are three resins—(1) *Guaiaconic Acid*, $C_{19}H_{20}O_5$ (70 per cent.). (2) *Guaiacic Acid*, resembling Benzoic Acid. (3) *Guaiaretic Acid*, $C_{20}H_{26}O_4$ (about 10 per cent.). These are insoluble in water, soluble in alkalies, but precipitated on neutralization.

Impurity.—Rosin.

Incompatibles.—Mineral acids, spirit of nitrous ether, acacia, chlorine water, metallic salts.

Dose, 1 gm. (15 gr.).

Preparations.

1. **Tinctura Guaiaci.**—Tincture of Guaiac. Guaiac, 200. By maceration with Alcohol, and filtration to 1000.
Dose, 4 c.c. (1 fl. dr.).

2. **Tinctura Guaiaci Ammoniata.**—Ammoniated Tincture of Guaiac. Guaiac, 200; by maceration with Aromatic Spirit of Ammonia, a
Dose, 2 c.

Diaphoretic ; emmenagogue; in large doses, a gast

Especially tonsillitis; chronic sore-throat; habitual constipation; chronic rheumatism; to ward off attacks of gout. It is a very disagreeable remedy.

XANTHOXYLUM.

XANTHOXYLUM. *Synonym.*—Prickly Ash Bark. The dried bark of *Xanthoxylum americanum* Miller (Northern Prickly Ash), or of *Fagara Clava-Herculis* (Linné) Small (Southern Prickly Ash) (Fam. *Rutaceæ*). *Habitat.*—North America.

CHARACTERS. *Northern Prickly Ash.*—In curved or quilled fragments, about 1 mm. thick; outer surface brownish gray, with whitish patches, and minute, black dots, faintly furrowed, with some brown, glossy, straight, two-edged spines, linear at the base, and about 5 mm. long; inner surface whitish, smooth; fracture short, non-fibrous, green in the outer and yellowish in the inner layer; inodorous; taste bitterish, very pungent.

Southern Prickly Ash.—In very large quills or sheets, 1 to 2 mm. thick, externally of a light purplish-gray with large silvery-gray patches, and marked by many large, corky projections, frequently 2 cm. high, which often bear stout, brown spines; otherwise like Northern Prickly Ash. *Resembling Xanthoxylum.*—*Aralia spinasa*, which is nearly smooth externally, and beset with slender prickles in transverse rows.

COMPOSITION.—It contains—(1) An acrid, green oil. (2) A resin, crystalline, white and tasteless. (3) An acrid, soft resin. (4) A bitter substance, probably an alkaloid. (5) Tannic acid, in small quantity.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Xanthoxyli.—Fluidextract of Xanthoxylum. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 2.00 c.c. (30 ♏).

ACTION.

Much the same as guaiac.

USES.

Chronic rheumatism; syphilis; tooth-ache; chronic hepatic disorders.

SARSAPARILLA.

SARSAPARILLA.—The dried root of *Smilax medica* Chamisso and Schlechtendal, *Smilax ornata* Hooker, *Smilax papyracea* Duhamel, or a dried root known commercially as Honduras Sarsaparilla, which is probably obtained from *Smilax officinalis* Kunth (Fam. *Liliaceæ*). *Habitat.*—Tropical America, from Mexico to Brazil.

CHARACTERS.—Usually more than 1 m. in length, and 4 to 6 mm. thick, with few or many roots adhering; externally varying from light gray-brown and smooth, with few deep and sharp wrinkles, to dark or orange-brown and less smooth, with more and smaller wrinkles; internally whitish, with a thick, mealy, or sometimes horny cortex, a circular wood-zone, and a thick pith; fracture tough; nearly inodorous; taste mucilaginous, somewhat sweetish and bitter, slightly acrid. The thick, woody, knotty rhizome, if present, should be removed. *Resembling Sarsaparilla.*—Senega, which is twisted and keeled; Hemidesmus, which is cracked transversely.

COMPOSITION.—The chief constituents are—(1) *Parillin* also named *Smilacin, Parillinic Acid and Pariglin*, about 0.2 per cent., an acrid glucoside, soluble in hot water and Alcohol, insoluble in Ether, closely resembling Saponin. (2) Resin. (3) Trace of a Volatile Oil. (4) Calcium Oxalate and other salts.

INCOMPATIBLES.—Alkalies, infusion of nutgall, lead acetate.

Dose, 2 gm. (30 gr.).

Preparations.

1. **Fluidextractum Sarsaparilla.**—Fluidextract of Sarsaparilla. By maceration and percolation with Alcohol and Water, and evaporation.

Dose, 2 c.c. (30 ♏).

2. **Fluidextractum Sarsaparillæ Compositum.**—Compound Fluidextract of Sarsaparilla. Sarsaparilla, 750; Glycyrrhiza, 120;

Sassafras, 100; Mezereum, 30. By maceration and percolation in Glycerin, Alcohol and Water and evaporation, to 1000.

Dose, 2 c.c. (30 ♏).

3. Syrupus Sarsaparillæ Compositus.—Compound Syrup of Sarsaparilla. Fluidextract of Sarsaparilla, 200; Fluidextract of Glycyrrhiza, 15; Fluidextract of Senna, 15; Oil of Sassafras, 0.2; Oil of Anise, 0.2; Oil of Gaultheria, 0.2; Sugar, 650. By mixing, filter[illegible]nd straining with water to 1000.

Dose, 16 c.c

It is not kn[illegible]ological action, though it is classed as a[illegible]

It is apparently useful only as a vehicle.

STILLINGIA.

STILLINGIA. *Synonyms.*—Queen's Root. Queen's Delight. The dried root of *Stillingia sylvatica* Linné (Fam. *Euphorbiaceæ*). *Habitat.*—Southern United States, in sandy soil.

CHARACTERS.—Slenderly fusiform, usually in cut pieces, of variable length and 0.5 to 3 cm. in diameter; externally reddish-brown, longitudinally wrinkled; fracture fibrous, bark light reddish-brown, 0.5 to 4 mm. thick, spongy, finely fibrous, with numerous resin cells, easily separable from the porous, radiate wood; odor distinct; taste bitter, acrid and pungent.

COMPOSITION.—(1) Sylvacrol, an acrid resin, soluble in Alcohol and Chloroform. (2) Probably a glucoside. (3) Resin. (4) Volatile Oil. (5) Tannic Acid.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Stillingiæ.—Fluidextract of Stillingia. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

In large doses emetic and cathartic; in smaller ones, alterative.

USES.

Syphilis; cutaneous and hepatic disorders.

LAPPA.

LAPPA. *Synonym.*—Burdock. The dried root of *Arctium Lappa* Linné, or of other species of *Arctium* (Fam. *Compositæ*), collected from plants of the first year's growth. *Habitat.*—Europe and Northern Asia; naturalized in North America.

CHARACTERS.—Nearly simple, fusiform, of variable length, 5 to 20 mm. in diameter near the crown; frequently split or in broken pieces; externally grayish-brown, longitudinally wrinkled, the crown somewhat annulate, sometimes surmounted by a wooly tuft of leaf remains; fracture somewhat horny; a dark cambium separating the thick brownish bark from the yellowish porous and radiate wood, centrally hollow or containing a white pith-like tissue; odor slight; taste mucilaginous, sweetish, and slightly bitter.

COMPOSITION.—The chief constituents are—(1) Possibly a glucoside. (2) Inulin. (3) Resin. (4) Tannic Acid, in small quantity.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Lappæ.—Fluidextract of Lappa. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

It is considered to be a diuretic and a diaphoretic alterative.

USES.

Various chronic skin diseases, especially psoriasis and acne.

SASSAFRAS.

SASSAFRAS.—The dried bark of the root of *Sassafras variifolium* (Salisbury) O. Kuntze (Syn. *Sassafras Sassafras* (Linné) Karsten) (Fam. *Lauraceæ*), collected in early spring or autumn, and deprived of the periderm. *Habitat.*—North America from Eastern Texas and Kansas eastward to Florida, and Ontario; in woods.

CHARACTERS.—In irregular transversely curved, reddish-brown pieces, of variable length and 0.5 to 5 mm. thick; outer surface nearly smooth; inner surface obscurely short-striate; soft, fragile, with a short, corky fracture; strongly fragrant; taste mucilaginous, aromatic and astringent.

COMPOSITION.—The chief constituents are—(1) A volatile oil (*see* below), about 5 per cent. (2) Sassafrid, a peculiar decomposition product of Tannic Acid. (3) Resin. (4) Tannic Acid.

Dose, 8 gm. (120 gr.).

Sassafras is contained in Fluidextractum Sarsaparillæ Compositum.

SASSAFRAS MEDULLA.—Sassafras Pith. The dried pith of *Sassafras variifolium.*

CHARACTERS.—In more or less cylindrical, often curved or coiled, pieces, of variable length and about 5 mm. in diameter, whitish, very light, with a slight odor and a mucilaginous taste. Macerated in water, it yields a mucilage which is not precipitated on the addition of Alcohol.

Mucilago ...cillage of Sassafras Pith.
Sassafras Pi... ...eration and straining.
Dose, 16 ...

OLEUM SA... ... A volatile oil distilled from the root, especia... *s variifolium.*
CHARACTERS.-... w liquid, having the characteristic odor of Sassafr... c taste. Sp. gr., 1.065 to 1.075.
Solubility.—Soluble, in all proportions in 90 per cent. Alcohol.
Dose, 0.2 c.c. (3 ♏).
Oil of Sassafras is contained in Syrupus Sarsaparillæ Compositus and Trochisci Cubebæ.

SAFROLUM.—Safrol. $C_{10}H_{10}O_2 = 160.86$. The Methylene Ether of Allyl Pyrocatechol ($C_6H_3 \cdot C_3H_5 \cdot (OOCH_2)$ 1 : 3 : 4), found in Oil of Sassafras, Camphor Oil, and other volatile oils, purified, if necessary, by repeated chilling and crystallization.

CHARACTERS.—A colorless or faintly yellow liquid with a sassafras-like odor. Sp. gr., 1.105 to 1.106. Boiling point, about 233° C. (451.4° F.). On cooling to — 20° C. (— 40° F.), or below, it solidifies to a mass of crystals, which do not melt below 11° C. (51.8° F.). *Solubility.*—In about an equal volume of strong Alcohol and about 30 parts of 70 per cent. Alcohol. Miscible in all proportions with Ether and Chloroform.
Dose, 0.3 c.c. (5 ♏).

ACTION.

It has the action of other volatile oils. The pith is demulcent.

USES.

The mucilage is somewhat stimulant, and is an excellent vehicle.

BERBERIS.

BERBERIS. *Synonym.*—Oregon grape root. The rhizome and roots of *Berberis aquifolium* Pursh, and other species of Berberis (Fam. *Berberidaceæ*). *Habitat.*—North America.

CHARACTERS.—In more or less knotty irregular pieces of varying length and from 3 to 20 mm. in diameter; bark from ½ to 2 mm. thick; wood yellowish; distinctly radiate, with narrow medullary rays, hard and tough; rhizome with a small pith; odor distinct; taste strongly bitter. Pieces without the bark should be rejected.

COMPOSITION.—It contains—(1) *Berberine* ($C_{20}H_{17}NO_4$), 2.5 per cent., an alkaloid occurring as yellowish prismatic crystals or a pale yellow, amorphous powder of a resinous aspect, odorless, very bitter, very slightly soluble in water, inflammable, and of an alkaline reaction. Its sulphate, carbonate and phosphate are given in doses of 0.03 to 0.1 gm.; ½ to 1½ gr., as stomachics and tonics, and from 0.5 to 1 gm.; 8 to 15 gr., as antiperiodics. (2) *Oxycanthine* ($C_{32}H_{46}N_2O_{11}$), 2.82 per cent., an alkaloid occurring as a white powder, turning yellow on exposure to light, having a bitter taste and an alkaline reaction. It is insoluble in water; soluble in 1 part of Alcohol and 30 parts of boiling Alcohol. (3) *Tannin.*

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Berberidis.—Fluidextract of Berberis. By maceration and percolation with Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

ACTION.

Stomachic, laxative, diuretic, alterative, and antiperiodic; by some it is considered to have a distinct action upon the liver.

USES.

In chronic skin diseases and syphilitic or scrofulous cachexia, chronic hepatitis, and convalescence from malarial and other fevers.

CALENDULA.

CALENDULA. *Synonym.*—Marigold. The dried ligulate florets of *Calendula officinalis* Linné (Fam. *Compositæ*). *Habitat.*—Levant and Southern Europe; cultivated.

CHARACTERS.—Florets 15 to 25 mm. long, yellow or orange-colored, one- to three-toothed, the short hairy tube occasionally enclosing the remnants of a filiform style and bifid stigma; odor slight and somewhat heavy; taste slightly bitter and faintly saline.

COMPOSITION.—The chief constituents are—(1) A peculiar principle, *Calendulin*, which is regarded as analogous to Bassorin. (2) An amorphous bitter principle. (3) Gum.

Dose, 1 gm. (15 gr.).

Preparation.

Tinctura Calendulæ.—Tincture of Calendula. Calendula, 200. By maceration and percolation with Alcohol to 1000.

ACTION.

Probably has no physiological action.

USES.

The tincture [illegible] ically to promote the healing process in [illegible] etc.

[illegible]A.

SCUTELLAR The dried plant of *Scutellaria lateriflora* [illegible] *abitat.*—North America; west to Alabama, Ne[illegible] damp thickets.

CHARACTERS.—[illegible] stem quadrangular, branched; leaves opposite, petiolate, about 5 cm. long, ovate-lanceolate or ovate-oblong, serrate; flowers about 6 mm. long, in axillary, one-sided racemes, with a pale blue corolla and bilabiate calyx, closed in fruit, the upper lip helmet-shaped; odor slight; taste bitterish.

COMPOSITION.—(1) A bitterish principle. (2) Volatile oil, a trace. **Dose, 1 gm. (15 gr.).**

Preparation.

Fluidextractum Scutellariæ.—Fluidextract of Scutellaria. By maceration and percolation with Diluted Alcohol, and evaporation. **Dose, 1 c.c. (15 ♏).**

ACTION.

It is believed to be antispasmodic and alterative.

USES.

As a nervous sedative.

GROUP XIII.—Drugs Used to Kill Parasites.

CLASS I.—ANTHELMINTICS FOR VARIOUS SPECIES OF TAPE-WORM.

Aspidium, Pomegranate, Kousso, Pumpkin Seed, Kamala.

ASPIDIUM.

ASPIDIUM. *Synonym.*—Male Fern. The dried rhizome of *Dryopteris Filix-mas* (Linné) Schott, or of *Dryopteris marginalis* (Linné) Asa Gray (Fam. *Filices*). *Habitat.*—North America, Northern Asia, Europe.

CHARACTERS.—Before being peeled, 10 to 15 cm. long by 5 to 7 cm. thick, including the densely imbricated, dark brown, cylindraceous, slightly curved stipe-bases and the dense mass of brownish, glossy, transparent, soft, chaffy scales; when peeled, 1 to 2 or 3 cm. thick, cylindraceous and nearly straight, or curved and tapering towards one end, roughly scarred with remains of the stipe-bases, or bearing several coarse longitudinal ridges and grooves; pale-green when first peeled, becoming pale-brown; fracture sharp, pale-green, the texture rather spongy, exhibiting from 6 to 10 steles in a loose and interrupted circle; odor disagreeable; taste bittersweet, astringent, acrid, and nauseous.

COMPOSITION.—The chief constituents are—(1) *Filicic acid*, $C_{35}H_{42}O_{13}$, a white, amorphous or crystalline body, said to be the active principle. (2) A fixed oil, 6 to 7 per cent. (3) *Filicin*, $C_{35}H_{40}O_{12}$, a crystalline substance, soluble in Chloroform, Benzol and fixed and volatile oils. (4) Filix-red. (5) Resins.

Dose, 4 gm. (60 gr.).

Preparation.

Oleoresina Aspidii.—Oleoresin of Aspidium. By percolation with Acetone, distillation of the Acetone, and evaporation. Oleoresin of Aspidium usually deposits, on standing, a granular, crystalline substance; this should be thoroughly mixed with the liquid portion before use.

Dose, 2 gm. (30 gr.).

ACTION.

Large doses cause nausea, vomiting, purging, intense abdominal pain, muscular weakness, cramps in the extremities, confusion, somnolence, coma and collapse; in some cases, disturbances of vision, or even complete loss of sight, in some convulsions, and in some jaundice.

USES.

For the treatment of tape-worms, to which it acts as a direct poison. Castor oil should never be administered with it, as this notably increases the absorption of filicic acid.

Toxicology.—Magnesium sulphate by the mouth and ammonia by subcutaneous injection.

GRANATUM.

POMEGRANATE.—The bark of the stem and root of *Punica Granatum* Linné (Fam. *Punicaceæ*). *Habitat.*—India and Southwestern Asia; cultivated and naturalized in subtropical countries.

CHARACTERS. *Stem Bark.*—In single quills or transversely curved pieces, mostly 2 to 10 cm. long, 5 to 20 mm. in diameter; bark 0.5 to 3 mm. thick; outer surface yellowish- to brownish-gray, with brownish-black fruit-heads of a lichen and small lenticels; inner surface grayish-yellow to brownish, finely striated; fracture short, smooth, the phelloderm layer dark green, the inner bark dull greenish-yellow; odor distinct; taste astringent, somewhat bitter.

Root Bark.—Dark brown, with more or less longitudinal patches and scales of cork; green phelloderm layer absent; medullary rays extending nearly to the periderm.

COMPOSITION.—The chief constituents are—(1) *Pelletierine* (*Punicine*), $C_8H_{13}NO$, ½ per cent., a colorless, oily, aromatic alkaloid, soluble in water, Alcohol, Ether and Chloroform. (2) Three allied alkaloids, *Methyl-*, *Pseudo-*, and *Isopelletierine*. (3) *Punicotannic Acid*, $C_{20}H_{16}O_{13}$, 20 per cent.

INCOMPATIBLES.—Alkalies, lime water, metallic salts, gelatin.

Dose, 2 gm. (30 gr.).

Preparation.

Fluidextractum Granati.—Fluidextract of Granatum. By percolation and maceration with Glycerin and Diluted Alcohol, and evaporation.

Dose, 2 c.c. (30 ♏).

PELLENTIERINÆ TANNAS.

PELLETIERINE TANNATE.—A mixture in varying proportions of the tannates of four alkaloids (Punicine, Iso-punicine, Methyl-punicine, and Pseudo-punicine), obtained from *Punica Granatum* Linné (Fam. *Punicaceæ*). It should be kept in small, well-stoppered, dark amber-colored vials.

CHARACTERS.—A light yellow, odorless, amorphous powder, having an astringent taste and a weak acid reaction. *Solubility.*—In 235 parts of water, 12.6 of Alcohol, and 300 of Ether; insoluble in Chloroform; soluble in warm diluted acids.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

ACTION.

It is a gastric irritant, and also causes flatulence and intestinal pain, and sometimes, but not always, free purgation. The urine is increased in quantity. Other symptoms produced by large doses are: disturbances of vision, hebetude, vertigo, confusion, muscular tremors and cramps, and general weakness. It

has a specific toxic action on the tape-worm. Pelletierine, when given in sufficient quantity, acts like curare, causing paralysis of the motor nerves, without affecting sensation or muscular contractility. It has a specific toxic action on tape-worms.

Uses.

Principally against tape-worm. It should be used with caution in the case of children. Pomegranate is occasionally employed, both locally and internally, for some of the same purposes as tannic acid and other astringents, and pelletierine has been used in paralysis of the third and sixth nerves. Pelletierine is one of the most reliable of tæniafuges, and is decidedly preferable to pomegranate itself on account of the facility with which it can be taken and its freedom from nauseating properties.

CUSSO.

KOUSSO. *Synonyms.*—Brayera. Kooso. The dried panicles of the pistillate flowers of *Hagenia abyssinica* (Bruce) Gmelin (Fam. *Rosaceæ*). *Habitat.*—Abyssinia.

Characters.—In rolls or compressed bundles from 25 to 40 cm. long, reddish-brown, each branch arising from the axile of a sheathing bract, and each flower furnished at its base with two rounded bracts; calyx tube top-shaped, pubescent, and bearing a circle, resembling an outer calyx, of five rigid, spreading, obovate purple-veined bracts, which are larger than the five usually shriveled and incurved calyx-lobes; the five caducous petals usually absent in the drug; carpels two; styles exserted and stigmas broad and hairy; odor slight; taste bitter. The large stems should be rejected.

Composition.—The chief constituents are—(1) *Kosin* or *Koussin*, a neutral, active principle, in yellow crystals, tasteless, soluble in Chloroform, Benzol, Ether and Alcohol; insoluble in water. (2) Oil. (3) Gum. (4) Tannic Acid. (5) Two Resins.

Dose, 16 gm. (240 gr.).

Action.

Anthelmintic and a gastro-intestinal irritant.

Uses.

Against tape-worm.

PEPO.

PEPO (Pumpkin Seed).—The ripe seed of *Cucurbita Pepo* Linné (Fam. *Cucurbitaceæ*). *Habitat.*—Tropical Asia and America; cultivated.

CHARACTERS.—Broadly ovate, flat, somewhat biconvex, about 20 mm. long and 2 mm. thick; externally whitish or yellowish-white, nearly smooth, with a shallow groove parallel to, and within 1 mm. of the margin; seed-coat consisting of a white coriaceous outer layer, and a membranaceous inner layer; embryo nical hypocotyl and two plano-convex cotyledo ontused; taste bland and oily.

COMPOSITION (2) An acrid Resin, considered to be the t Proteids (*Myosin* and *Vitellin*). (4) Fatty A

Dose, 30

It has no known physiological effects.

USES.

It is one of the most efficient and at the same time harmless tæniafuges, in which capacity it is exclusively employed.

Unofficial Preparation.

Kamala.—Kamala. *Synonym.*—Rottlera. The glands and hairs from the capsules of *Mallotus philippinensis* (Lamarck) Mueller Arg. (Fam. *Euphorbiaceæ*). *Habitat.*—India, China and Philippine Islands.

CHARACTERS.—A granular, mobile, brick-red or brownish-red powder, inodorous and nearly tasteless, imparting a deep red color to alkaline liquids, Alcohol, Ether, or Chloroform, and a pale, yellow tinge to boiling water. Under the microscope it is seen to consist of stellately arranged, colorless hairs, mixed with depressed-globular glands, containing numerous red, club-shaped vesicles. *Solubility.*—Insoluble in hot and cold water.

COMPOSITION.—The chief constituents are—(1) *Rottlerin*, $C_{22}H_{20}O_6$, a neutral principle in yellowish needles, soluble in hot Alcohol, Ether, Benzene, and Carbon Disulphide. (2) Resins, nearly 80 per cent.

Dose, 4 to 8 gm.; 1 to 2 dr.

ACTION.

Anthelmintic; purgative.

USES.

Especially for tape-worm.

CLASS II.—ANTHELMINTICS FOR THE ROUND-WORM (*Ascaris lumbricoides*).

Santonica, Spigelia, Chenopodium.

SANTONICA.

SANTONICA. *Synonym.*—Levant Wormseed. The dried unexpanded flower-heads of *Artemisia pauciflora* (Ledebour) Weber (Fam. *Compositæ*). *Habitat.*—Turkestan.

CHARACTERS.—Heads 2 to 4 mm. long, oblong-ovoid, slightly flattened, obtuse, consisting of an involucre of about 12 to 18 closely imbricated, glandular scales with a broad midrib, enclosing four or five rudimentary florets. Santonica has the appearance of a granular, yellowish-green or greenish-brown, somewhat glossy powder; odor strong, peculiar, somewhat camphoraceous; taste aromatic and bitter.

COMPOSITION.—The chief constituents are—(1) *Santonin* (*see* below). (2) A volatile oil, 2 per cent., consisting mainly of *Cineol*, $C_{10}H_{18}O$.

SANTONINUM.—*Santonin.* $C_{15}H_{18}O_3 = 244.29$. The inner anhydride or lactone of Santonic Acid, obtained from Santonica. It should be kept in dark, amber-colored vials and in a dark place.

SOURCE.—By exhausting Santonica, mixed with Lime, with Diluted Alcohol, distilling off the Alcohol, and adding Acetic Acid to the residue. The precipitated Santonin is purified by dissolving it in Alcohol, treating with Animal Charcoal, and crystallizing.

CHARACTERS.—Colorless, shining, flattened, rhombic prisms; odorless, and nearly tasteless when first put in the mouth, but afterwards developing a bitter taste; permanent in the air, but turning yellow on exposure to light. *Solubility.*—In 5300 parts of water, 34 of Alcohol, 78 of Ether, and 2.5 of Chloroform; in 800 parts of water at 80° C. (176° F.) and 5 parts of Alcohol at 60° C. (140° F.).

IMPURITIES.—Alkaloids, sugar and other readily carbonizable organic impurities.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Preparation.

Trochisci Santonini.—Troches of Santonin. Santonin, 3; Sugar, 90; Tragacanth, 3; Stronger Orange Flower Water, to make 100 troches. Each troche contains about .03 gm. (½ gr.). These troches should be kept in dark amber-colored vials.

ACTION.

It causes a derangement of color vision (xanthopsia, or yellow vision) and also a discoloration of the urine (lemon-yellow

or saffron when the urine is acid, and carmine or purplish-red when it is alkaline). In large doses it gives rise to epileptiform convulsions, which are believed to be due to stimulation of the cerebral cortex, and other serious disturbances; in fatal cases death results from asphyxia.

As a verm

Toxicology.— d bowels; ammonia or strychnine sulphate chloroform for the convulsions.

SPIGELIA. arolina Pink. The dried rhizome and roots of *Spigelia marilandica* Linné (Fam. *Loganiaceæ*). *Habitat.*—Southern United States; westward to Texas and Wisconsin, in rich woods.

CHARACTERS.—Rhizome of oblique and sharply flexuous growth, somewhat branched, 1.5 to 5 cm. long, 2 to 4 mm. in diameter; externally dark purplish-brown or blackish, the upper surface knotty from approximate stem-bases bearing cup-shaped scars; the lower surface with numerous long, rather coarse, finely branched roots; fracture short, showing a yellowish wood and a dark pith; odor somewhat aromatic; taste bitter and pungent. *Resembling Spigelia root.—Phlox Carolina*, but the rootlets are brownish-yellow, rather coarse, straight, and contain a straw-colored wood underneath a readily removable bark.

COMPOSITION.—(1) *Spigeline*, a volatile alkaloid. (2) A little volatile oil. (3) Bitter principle. (4) Resin.

Dose, 4 gm. (60 gr.).

Preparation.

Fluidextractum Spigeliæ.—Fluidextract of Spigelia. By maceration and percolation with Diluted Alcohol, and evaporation.
Dose, 4 c.c. (1 fl. dr.).

ACTION.

Anthelmintic; large doses may cause marked flushing, frequently associated with œdematous swelling, of the face, and, in addition, spasm of the facial muscles, dimness of vision, vertigo, stupor, and even convulsions.

Uses.

Against lumbricoid worms; when given in combination with a cathartic (senna is usually preferred), it is much less liable to give rise to symptoms of narcotic poisoning.

Unofficial Preparation.

Chenopodium.—Chenopodium. *Synonym.*—American Wormseed. The fruit of *Chenopodium anthelminticum* Linné (Fam. *Chenopodiaceæ*). *Habitat.*—West India and Central America; naturalized in the United States.

Characters.—Nearly 2 mm. in diameter, depressed-globular, glandular, dull greenish or brownish, the integuments friable, and containing a lenticular, obtusely-edged, glossy, black seed. It has a peculiar, somewhat terebinthinate odor, and a bitterish, pungent taste.

Composition.—It is composed chiefly of volatile oil, consisting of (1) a hydrocarbon, $C_{10}H_{16}$, and (2) a liquid, oxygenated oil $C_{10}H_{16}O$.

Dose, 1 to 2 gm.; 15 to 30 gr.

OLEUM CHENOPODII.—Oil of Chenopodium. *Synonym.*—Oil of American Wormseed. A volatile oil distilled from *Chenopodium.*

Characters.—A thin, colorless or yellowish liquid, having a peculiar, penetrating, somewhat camphoraceous odor, and a pungent and slightly bitter taste. Sp. gr., about 0.965 to 0.985. *Solubility.*—It should be soluble in 5 volumes of 70 per cent. Alcohol.

Dose, 0.2 c.c. (3 ♏).

Action.

Stimulant to the circulation and nervous system; anthelmintic.

Uses.

One of the most efficient anthelmintics, particularly against *ascarides*, but it should be followed by a cathartic.

CLASS III.—ANTHELMINTICS FOR THE THREAD-WORM (*Oxyuris vermicularis*).

Calumba, Quassia, Nutgall.

CALUMBA.—Calumba (*see* p. 331).

QUASSIA.—Quassia (*see* p. 333).

GALLA.—Nutgall (*see* p. 342).

CLASS IV.—ANTHELMINTICS FOR THE HOOK-WORM
(*Ankylostoma duodenale.—Uncinaria Americana*).

Thymol, Betanaphthol.

THYMOL.

THYMOL. — $C_{10}H_{14}O = 148.98$. A phenol [$C_6H_3(CH_3)(OH)(C_3H_7)$ 1 : 3 : 4] occurring in the volatile oil of *Thymus vulgaris* Linné, and in some other volatile oils. *Habitat.*—Southern Europe, cultivated; United States, west to Texas and Colorado, in sandy fields; India, Persia, Egypt.

SOURCE.—Thymol is separated from the terpenes in the volatile oils by fractional distillation, agitated with solution of Sodium Hydroxide to remove more of the terpenes and cooled. The compound of Sodium Hydroxide and Thymol is decomposed by Hydrochloric Acid, and Thymol is re-crystallized from an alcoholic solution.

CHARACTERS.—Large, colorless, translucent rhombic prisms, having an aromatic, thyme-like odor, and a pungent, aromatic taste, with a very slight caustic effect upon the lips. Sp. gr., as a solid, 1.030; when liquefied by fusion it is lighter than water. When triturated with about equal quantities of Camphor, Menthol, or Hydrated Chloral, it liquefies. *Solubility.*—In about 1100 parts of water, and in less than its own weight of Alcohol, Ether, or Chloroform; soluble in Glacial Acetic Acid and fixed and volatile oils.

IMPURITIES.—Inorganic impurities.

Dose, 0.125 gm. = 125 milligm. (2 gr.).

Thymol is contained in Cataplasma Kaolini and Liquor Antisepticus.

Preparation.

Thymolis Iodidum.—Thymol Iodide. (*See* p. 193.)

ACTION.

Its effects resemble those of phenol, though it causes less stimulation of the central nervous system; it is also more slowly absorbed, less irritant to raw surfaces, and less toxic. While it is more powerfully antiseptic than phenol, it is less soluble than it in the fluids of the body. It has the effect of imparting to the urine, which is sometimes increased by it, a dark, greenish color.

USES.

As an antiseptic dressing and in dermatology and dentistry; by inhalation, in laryngitis, bronchitis, whooping-cough, phthisis, diphtheria, and gangrene of the lung; by injection, in gonorrhœa

and vesical catarrh; internally, in gastric and intestinal catarrh, in chyluria of filarious origin, and as an anthelmintic for the *Ankylostoma duodenale*. In ankylostomiasis (uncinariasis), or hook-worm disease, thymol is considered almost a specific.

BETANAPHTHOL.—Betanaphthol (*see* p. 196).

CLASS V.—PARASITICIDES FOR PEDICULI.

Staphisagria, Picrotoxin.

STAPHISAGRIA.

STAPHISAGRIA. *Synonym.*—Stavesacre. The ripe seed of *Delphinium Staphisagria* Linné (Fam. *Ranunculaceæ*). *Habitat.*—Basin of the Mediterranean; cultivated.

CHARACTERS.—Irregularly tetrahedral, one side convex, 5 to 6 mm. long, 3 to 6 mm. broad; externally blackish-brown, becoming lighter with age, strongly reticulate; endosperm oily, enclosing a small, straight embryo; odor slight; taste intensely bitter and acrid.

COMPOSITION.—The chief constituents are—(1) *Delphinine*, $C_{22}H_{35}NO_6$, a white, crystalline poisonous alkaloid, soluble in Alcohol, Ether and Chloroform, resembling Aconite in its action. (2) *Delphinoidine*, $C_{42}H_{68}N_2O_7$, an amorphous alkaloid; solubility as of Delphinine. (3) *Delphisine*, $C_{27}H_{46}N_2O_4$, a crystalline alkaloid of the same solubility, (4) *Staphisagrine*, $C_{22}H_{32}NO_5$, an alkaloid but slightly soluble in water. (5) Fixed oil, 25 per cent.

Dose, 0.065 gm. = 65 milligm. (1 gr.).

Preparation.

Fluidextractum Staphisagriæ.—Fluidextract of Staphisagria. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 0.05 c.c. (1 ♏).

ACTION.

Externally, irritant and parasiticidal; internally it is a gastro-intestinal irritant and a depressant to the motor nerves, heart and respiration.

USES.

Locally in pediculosis, scabies and prurigo senilis.

Unofficial Preparation.

Picrotoxinum.—Picrotoxin. $C_{30}H_{34}O_{13} = 600.58$. A neutral principle obtained from the seed of *Anamirta paniculata* Colebrooke (Fam. *Menispermaceæ*). *Synonyms.*—Cocculus Indicus. Fishberry. *Habitat.*—East India.

SOURCE.—Obtained by exhaustion with hot Alcohol, evaporation and purification by re-crystallization, after decolorizing with Animal Char

CHARACT ining, prismatic crystals, or a micro- , and having a very bitter taste; perma ty.—Soluble in 240 parts of water, a lso soluble in solutions of the alkalies, soluble in Ether or Chloroform.

Dose, .00 gr.

ACTION.

It is an energetic parasiticide and a powerful convulsive poison, acting mainly on the medulla oblongata; in very small doses, a bitter tonic.

USES.

Scabies; trichophytosis, tinea versicolor, and other parasitic cutaneous diseases; its employment thus externally is attended with considerable danger from poisoning.

CLASS VI.—PARASITICIDE FOR VEGETABLE CUTANEOUS PARASITES.

Chrysarobin.

CHRYSAROBINUM.

CHRYSAROBIN. $C_{30}H_{26}O_7 = 494.46$. *Synonyms.*—Rhein. Chrysophan (*see* p. 298). A neutral principle extracted from Goa (or Araroba) Powder, a substance found deposited in the wood of *Vouacapoua Araroba* (Aguiar) Druce (Fam. *Leguminosæ*). It should be preserved in glass-stoppered, amber-colored vials.

In the fresh plant Chrysarobin, which is the chief constituent of Goa Powder, probably exists as a glucoside, but this is slowly oxidized into Chrysophanic Acid ($C_{15}H_{10}O_4$) and Glucose. *Habitat.*—Brazil.

CHARACTERS.—A pale, orange-yellow, micro-crystalline powder, odorless, tasteless, and irritating to the mucous membrane. Sp. gr., 0.920 to 0.922.

Solubility.—In 4812 parts of water, 308 of Alcohol, 25 of Benzene, 18 of Chloroform, 114 of Ether, 30 of Amyl Alcohol, and 230 of Carbon Disulphide at 25° C. (77° F.); in 2170 parts of water at 80° C. (176° F.), and in 275 of Alcohol at 60° C. (140° F.); in dilute or concentrated solutions of Potassium Hydroxide, forming a red-colored liquid, with green fluorescence.

IMPURITY.—Chrysophanic acid.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

Preparation.

Unguentum Chrysarobini.—Chrysarobin Ointment. Chrysarobin, 6; Benzoinated Lard, 94.

ACTION.

It is a vegetable parasiticide and a powerful local irritant; stains the skin a dark yellowish-brown or purple color. Internally it is a gastro-intestinal irritant, producing copious, watery, brownish-colored stools, with repeated vomiting; it imparts to the urine a yellow color, which turns to red upon the addition of alkalies.

USES.

For vegetable parasitic eruptions and as a stimulating application in chronic inflammatory diseases of the skin, especially psoriasis. It should be employed with caution, as it is liable to set up dermatitis of the surrounding integument, and when applied to the face, to cause œdema of the eyelids or conjunctivitis. It is but little used internally.

GROUP XIV.—Drugs Used for Flavoring Agents.

Oil of Lemon, Vanilla, Salvia.

OLEUM LIMONIS.—Oil of Lemon (*see* p. 340).

VANILLA.

VANILLA.—The cured, full grown, but immature, fruit of *Vanilla planifolia* Andrews (Fam. *Orchidaceæ*). *Habitat.*—Eastern Mexico, in hot, damp woods; cultivated in the tropics.

CHARACTERS.—Linear, narrowed, and bent or hooked at the rather oblique base, about 15 to 25 cm. long and about 7 mm. thick; externally blackish-brown, longitudinally wrinkled, glossy, frequently covered with an efflorescence of Vanillin in acicular crystals, flexible and tough, 1-celled,

containing a blackish-brown pulp and numerous minute, blackish, ovoid and flattened seeds; odor and taste characteristic and very agreeable.

COMPOSITION.—Its chief constituents are—(1) *Vanillin*, $C_8H_8O_3$, a crystalline principle, 1.7 to 2.75 per cent., which develops upon the ripening of the pod. (2) Fixed Oil, 11 per cent. (3) Resin. (4) Sugar. (5) Mucilage. Vanillin is the Aldehyde of Methylprotocatechuic Acid; and can be prepared artificially from Coniferin, Phenol, Guaiacol and Eugenol, $C_{10}H_{12}O_2$, the L[illegible]oves (*see* p. 364).

Tinctura[illegible]illa. Vanilla, 100; Sugar, 200; by m[illegible] Water to 1000.

VANILLIN [illegible]150.92. Methylprotocatechuic Aldehyde (C_6H_3[illegible], occurring naturally in Vanilla, or made artifi[illegible]ydroxybenzene derivatives.

CHARACTERS.—Fine, white, crystalline needles, having the odor and taste of Vanilla and an acid reaction. *Solubility.*—In about 100 parts of water; readily in Alcohol, Ether, Glycerin, or Chloroform.

IMPURITY.—Acetanilide.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

ACTION.

It is probably inert as regards any action on the human system. Vanillin is said to be locally irritant and to produce spinal convulsions in frogs.

USES.

Almost solely as a flavoring agent. Vanillin has been suggested as a stomachic and an excito-motor remedy.

SALVIA.

SALVIA. *Synonym.*—Sage. The dried leaves of *Salvia officinalis* Linné (Fam. *Labiatæ*). *Habitat.*—Southern Europe; cultivated.

CHARACTERS.—Long and stoutly petiolate; the blade elliptical or ovate-oblong, 3 to 7 cm. long, obtuse or subacute at the summit, rounded or subcordate at the base, finely crenulate, thick, grayish-green, very pubescent, especially on the under surface, conspicuously reticulate-veined; odor aromatic; taste aromatic, bitter and somewhat astringent.

COMPOSITION.—It contains—(1) A volatile oil, containing *Salviol*, $C_{10}H_{18}O$, *Cineol and Pinene*. (2) Resin. (3) Tannic acid.

Dose, 2 gm. (30 gr.).

ACTION.

That of the volatile oils generally; it is also astringent by reason of its tannic acid.

USES.

To check the perspiration of hectic fever; as a gargle and an astringent wash for the mouth or nasal passages; as an injection in urethritis or cystitis.

GROUP XV.—Drugs Used for Coloring Agents.

Red Saunders.

SANTALUM RUBRUM.

RED SAUNDERS.—The heart-wood of *Pterocarpus santalinus* Linné filius (Fam. *Leguminosæ*).. *Habitat.*—Madras; cultivated.

CHARACTERS.—Usually in chips, or a coarse, brownish-red powder; in transverse section slightly radiate, with numerous concentric rings, the medullary rays being 1 cell in width; nearly inodorous and almost tasteless. It imparts a red color to Alcohol, but not to water. *Resembling Red Saunders.*—Logwood, which is less dense.

COMPOSITION.—The chief constituents are—(1) *Santalin*, $C_{15}H_{14}O_5$, in red needles. (2) *Santal*, $C_8H_6O_3$, in colorless scales. (3) *Pterocarpin*, $C_{20}H_{16}O_6$. (4) *Homopterocarpin*, $C_{24}H_{24}O_6$, in colorless crystals.

Red Saunders is contained in Tinctura Lavandulæ Composita.

ACTION.

It has no value medicinally.

USES.

To color preparations.

GROUP XVI.—Drugs Whose Action is Mechanical.

Purified Cotton, Pyroxylin, Oil of Theobroma, Mastic, Rubber, Lycopodium, Quillaja.

GOSSYPIUM PURIFICATUM.

PURIFIED COTTON. *Synonym.*—Absorbent Cotton. The hairs of of the seed of *Gossypium herbaceum* Linné, or of other species of *Gossypium* (Fam. *Malvaceæ*), freed from adhering impurities and deprived of fatty matter. *Habitat.*—Tropical Asia and Africa; cultivated in the United States.

CHARACTERS.—White, soft, fine filaments, appearing under the micro-

scope as hollow, flattened and twisted bands, spirally striate, and slightly thickened at the edges; inodorous and tasteless; insoluble in ordinary solvents, but soluble in an ammoniacal solution of Cupric Oxide.

IMPURITY.—Fatty matter.

PYROXYLINUM.—Pyroxylin. *Synonyms.*—Gun Cotton. Soluble Gun Cotton. Calloxylin. A product obtained by the action of Nitric and Sulphuric Acids on Cotton, and consisting chiefly of Cellulose Tetranitrate, $C_{12}H_{16}(ON$ ept in cartons, protected from the light.

SOURCE.—Pu sed in a mixture of Sulphuric, 2200; and Nitric large quantity of Water, drained and dried.

CHARACTERS mass of filaments, resembling raw cotton in uch; exceedingly inflammable, burning, when a luminous flame; less explosive than Cellulose ly but completely in 25 parts of a mixture of 3 volumes of Ether and 1 volume of Alcohol; soluble in Acetone and in Glacial Acetic Acid.

Preparations.

1. **Collodium.**—Collodion. Pyroxylin, 40; dissolved in Ether, 750; and Alcohol, 250.

2. **Collodium Cantharidatum.**—Cantharidal Collodion. *Synonym.*—Blistering Collodion. Cantharides, 60; by percolation with Chloroform, evaporation and solution of residue in Flexible Collodium, 85.

3. **Collodium Flexile.**—Flexible Collodion. Collodion, 920; Canada Turpentine, 50; Castor Oil, 30.

4. **Collodium Stypticum.**—Tannic Acid, 20; Alcohol, 5; Ether, 25; Collodion, to 100. By solution.

ACTION.

None.

USES.

In various forms as a covering, protection, or support, and also for the topical application of remedies.

OLEUM THEOBROMATIS.

OIL OF THEOBROMA. *Synonym.*—Cacao Butter. A fixed oil expressed from the roasted seeds of *Theobroma Cacao* Linné (Fam. *Sterculiaceæ*). *Habitat.*—South America.

CHARACTERS.—A yellowish-white solid, having a faint, agreeable odor, and a bland, chocolate-like taste. Sp. gr., 0.970 to 0.976. *Solubility.*—Readily in Ether, Chloroform, or Benzene; also soluble in 100 parts of cold Absolute Alcohol and in 20 parts of boiling Absolute Alcohol.

COMPOSITION.—The chief constituents are—(1) *Stearin.* (2) *Olein.* (3) *Theobromine*, an alkaloid, $C_7H_8N_4O_2$. (4) Formic, Acetic and Butyric Acid Glycerides.

IMPURITIES.—Wax, stearin, tallow.

ACTION.

Nutrient; emollient.

USES.

By inunction to improve the nutrition of the body; to make suppositories.

MASTICHE.

MASTIC.—A concrete resinous exudation from *Pistacia Lentiscus* Linné (Fam. *Anacardiaceæ*). *Habitat.*—Mediterranean basin.

CHARACTERS.—In subglobular, lenticular, elongated or pear-shaped tears, about 3 mm. in diameter, pale yellow or greenish-yellow, transparent, having a glass-like lustre, the surface sometimes very slightly dusty; brittle, becoming plastic when chewed; odor, slight, balsamic; taste, mild, terebinthinate. *Solubility.*—Completely in Ether and almost completely in Alcohol. *Resembling Mastic.*—Acacia, which is larger, rougher, and more opaque.

COMPOSITION.—The chief constituents are—(1) A resin, $C_{20}H_{32}O_2$, *Mastichic Acid*, 90 per cent.; soluble in Alcohol. (2) *Masticin*, a resin, insoluble in Alcohol. (3) Volatile oil, $C_{10}H_{16}$, 1 to 2 per cent.

IMPURITY.—Sandarac.

Dose, 2 gm. (30 gr.).

Preparation.

Pilulæ Aloes et Mastiches (Lady Webster's pill).—Purified Aloes, 13; Mastic, 4; Red Rose, 3; to make 100 pills.

Dose, 2 pills.

ACTION.

It is said to be a mild stimulant.

USES.

As a masticatory, and for cements and varnishes.

ELASTICA.

RUBBER. *Synonyms.*—India-rubber. Caoutchouc. The prepared milk-juice of several species of *Hevea* Aublet (Fam. *Euphorbiaceæ*), known in commerce as Para Rubber. *Habitat.*—In tropical countries.

CHARACTERS.—In flask-shaped or roundish masses, or in pieces of the same with sharply incised surfaces and a laminated structure; floating on water; externally brownish to brownish-black; internally of a lighter tint, mottled; odor creosote-like; nearly tasteless. *Solubility.*—Pure Para Rubber is insolu or dilute solutions of alkalies; soluble in Chlore Oil of Turpentine, Petroleum Benzin, and Ben ut 125° C. (257° F.), it melts, remaining soft a

COMPOSITION $C_{20}H_{32}$. (2) Fat. (3) Volatile oil. (4) C ning it with 10 per cent. of Sulphur, Vulca th 50 per cent., and hardening by pressure, Vu uced.

ACTION.

None.

USES.

For making plasters, bougies, pessaries and syringes.

LYCOPODIUM.

LYCOPODIUM. *Synonyms.*—Vegetable Sulphur. Club Moss. The spores of *Lycopodium clavatum* Linné, or of other species of *Lycopodium* (Fam. *Lycopodiaceæ*). *Habitat.*—Europe, Asia and North America, in dry woods.

CHARACTERS.—A fine, pale yellowish, very mobile powder, nearly inodorous, and tasteless, floating upon water and not wetted by it, but sinking on being boiled with it, and burning with a quick flash when thrown into a flame. Spores tetrahedral, with one convex side, the surface being delicately articulated.

COMPOSITION.—(1) Fixed oil, 47 to 49 per cent. (2) Cane Sugar, 2 per cent. (3) A volatile base, *Methylamine*, in minute quantities.

IMPURITIES.—Pollen, starch and sand.

ACTION.

Has the property of absorbing oils and oleoresins, and is powerfully repellent to water.

USES.

As a basis for pills and for insufflations; as a dusting powder.

QUILLAJA.

LAJA.—*Synonyms.*—Panama Bark. Soap Bark. The dried bark *aja Saponaria* Molina (Fam. *Rosaceæ*), deprived of the periderm. .—Chili and Peru.

RACTERS.—In flat pieces of variable length, 3 to 8 mm. thick, or ll chips; outer surface brownish-white, often with small patches of attached, otherwise nearly smooth; inner surface yellowish-white, smooth, with occasional circular depressions, conical projections, nsverse channels; fracture uneven and strongly fibrous, the laminæ ue to each other; odor slight; taste acrid. The powder is strongly tatory, and contains Calcium Oxalate in monoclinic pyramids and s from 0.035 to 0.200 mm. long.

MPOSITION.—(1) *Saponin*, about 9 per cent. (*see* p. 267), a mixture e Glucosides, *Quillaic Acid*, $C_{19}H_{30}O_{10}$, and *Sapotoxin*, $C_{17}H_{26}O_{10}$.

Preparations.

1. **Fluidextractum Quillajæ.**—Fluidextract of Quillaja. By maceration and percolation with diluted Alcohol.

Dose, 0.2 c.c. (3 ♏).

2. **Tinctura Quillajæ.**—Tincture of Quillaja. Quillaja, 200; by boiling with Water, straining and washing, addition of Alcohol, 350; filtration and addition of Water to 1000.

Action.

It is allied to senega in its properties, but is a much more powerful irritant.

Uses.

Chiefly as an ingredient of hair lotions; also in applications for chronic eczema, alopecia circumscripta, and some forms of acne, and internally as an expectorant.

DIVISION III.—DRUGS OF ANIMAL ORIGIN.

GROUP I.—Drugs Acting Chiefly on the Nervous System and Heart.

Musk.

MOSCHUS.

MUSK.—The dried secretion from the preputial follicles of *Moschus moschiferus* Linné. *Habitat.*—Central Asia.

Characters.—Usually irregular, crumbly, somewhat unctuous grains, dark reddish-brown, having a peculiar, penetrating and persistent odor, and

a bitterish taste. *Solubility.*—About 10 to 12 per cent. of Musk is soluble in Alcohol, the solution being light brownish-yellow, and on the addition of water becoming slightly turbid. From 50 to 75 per cent. of Musk is soluble in water, the solution being deep brown, faintly acid, and strongly odorous.

COMPOSITION.—(1) *Ammonia.* (2) An Acid. (3) Cholesterin. (4) Fats and Oils. (5) Wax. (6) Gelatinous and albuminous principles. The odoriferous principle has not been isolated, but it is probably a product of decomposition complete drying destroys the odor, but it retur

IMPURITIES.—I d other substances.

Dose, 0.250 g

Tinctura usk. Musk, 5; Alcohol, 45; Water, . tion with Diluted Alcohol, to 100.

Dose, 4 c.c. (1 fl. dr.).

ACTION.

Stimulant; antispasmodic.

USES.

Empirically in spasmodic diseases and as a stimulant in asthenic conditions; it is but little used at present.

GROUP II.—The Purgatives.

Oxgall, Honey.

FEL BOVIS.

OXGALL. The fresh bile of *Bos Taurus* Linné. *Habitat.*—Domesticated.

CHARACTERS.—A brownish-green or dark green, somewhat viscid liquid, having a peculiar, unpleasant odor, and a disagreeable, bitter taste. Sp. gr., 1.015 to 1.025.

Preparation.

Fel Bovis Purificatum.—Purified Oxgall.

SOURCE.—Evaporate Oxgall, 300, to 100; add Alcohol, 100. Decant, filter, and after distillation of the Alcohol, evaporate.

CHARACTERS.—A yellowish-green, soft solid, having a peculiar odor, and a partly sweet and partly bitter taste. *Solubility.*—Very soluble in water and in Alcohol.

Dose, 0.500 gm. = 500 milligm. (7½ gr.).

ACTION.

Added to albuminous solutions, it delays their decomposition; the absorption of fats is aided by it; if given by the mouth it is mostly absorbed from the intestine and acts as a cholagogue.

USES.

As a cholagogue purgative; impacted fæces (by enema); as an antiseptic in intestinal fermentation.

MEL.

HONEY.—A saccharine secretion deposited in the honey-comb by the bee, *Apis mellifera* Linné. *Habitat.*—Domesticated.

CHARACTERS.—A syrupy liquid of a light yellowish to yellowish-brown color, translucent when fresh, but gradually becoming opaque and crystalline, having a characteristic, aromatic odor, and a sweet, faintly acrid taste.

COMPOSITION.—The chief constituents are—(1) *Dextrose* or Grape Sugar. (2) *Glucose* or Fruit Sugar. (3) Wax. (4) Volatile oil. (5) Formic Acid, a minute quantity.

IMPURITIES.—Chlorides, sulphates, starch, starch and cane sugar.

Preparation.

Mel Depuratum.—Clarified Honey. Melt Honey in a water-bath, add enough Distilled Water to make up the loss incurred by evaporation, strain, and mix the strained liquid with 5 per cent. of its weight of Glycerin.

Clarified Honey is contained in Confectio Rosæ, Massa Ferri Carbonatis, and Mel Rosæ.

ACTION.

Demulcent; nutritive; slightly laxative.

USES.

Constipation in children; to relieve dryness of the mouth; as a pleasant addition to gargles or vehicle for astringents and expectorants.

GROUP III.—The Digestants.

Pepsin, Pancreatin, Trypsin.

PEPSINUM.

PEPSIN.—A proteolytic ferment, or enzyme, obtained from the glandular layer of the fresh stomach of the hog (*Sus scrofa*, var. *domesticus* Gray),

and proved, when assayed, to be capable of digesting not less than 3000 times its own weight of freshly coagulated and disintegrated Egg Albumin. Sugar of Milk should be employed as the diluent when it is desired to reduce Pepsin of a higher power to that required by the U.S.P. *Habitat.*—Domesticated.

SOURCE.—The mucous membrane of a pig's stomach, dissected off and finely chopped, is macerated in water, acidulated with Hydrochloric Acid for several days, with frequent stirring. The strained liquor is decanted and Sodium Chlo everal hours the floating mixture is skimmed fr in cotton cloth to drain, and finally submitted l of the saline solution.

CHARACTERS.— w or yellowish, transparent or translucent s hite, or cream-colored, amorphous powder, and having a slightly acid or saline taste. It ghtly hygroscopic. *Solubility.*—Soluble, or alr 50 parts of water, the solution having more or less op ble in water acidulated with Hydrochloric Acid; insoluble in Alcohol, Ether or Chloroform.

Dose, 0.250 gm.=250 milligm. (4 gr.).

ACTION.

Its only action appears to be on the digestive system; in alkaline solution it is not only inert, but is rapidly decomposed.

USES.

As an aid to stomach digestion; for the predigestion of albuminous foods, though, as a rule, pancreatin is to be preferred for this purpose.

PANCREATINUM.

PANCREATIN. *Synonym.*—Zymine. A mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog (*Sus scrofa*, var. *domesticus* Gray), or the ox (*Bos taurus* Linné), and consisting principally of Amylopsin, Myopsin, Trypsin and Steapsin, and proved, when assayed, to be capable of converting not less than 25 times its own weight of Starch into substances soluble in water. *Habitat.*—Domesticated.

SOURCE.—Macerate the cut-up pancreas in water acidulated with Hydrochloric Acid for forty-eight hours, add a saturated solution of Sodium Chloride, allow to stand until the Pancreatin rises to the surface; skim this, drain in a muslin filter, wash with a less concentrated solution of salt until nearly dry; then rub up with Sugar of Milk, dry thoroughly without heat,

and dilute with Sugar of Milk, until 10 gr.; .60 gm., will just emulsify 2 fl. dr.; 8 c.c., of Cod Liver Oil.

CHARACTERS.—A cream-colored, amorphous powder, having a faint, peculiar, not unpleasant odor, and a somewhat meat-like taste. *Solubility.*—Slowly soluble in water, and containing not more than 10 per cent. of substances insoluble in this solvent; insoluble in Alcohol.

Dose, 0.500 gm. = 500 milligm. (7½ gr.)

ACTION.

In the presence of alkalies it has the power of digesting albuminoids and all proteid substances, which are changed to peptones, of converting starch into sugar, and, when not over twenty-four hours old, of emulsionizing fats.

USES.

As an artificial agent to assist digestion; for the predigestion of food.

Unofficial Preparation.

Trypsinum.—Trypsin. One of several ferments found in the Pancreatic Juice. It may be obtained in the form of a powder for administration, like Saccharated Pepsin; but a better form would be in a recent solution made directly from the pancreas in diluted Alcohol (Liquor Pancreaticus). The pancreas is minced or ground, thoroughly mixed and exhausted with water, strained, and diluted Alcohol added to preserve it.

ACTION.

The function of Trypsin is, when in alkaline solution, to convert albuminous bodies into peptones; it will digest and render soluble mucous and fibrous deposits.

USES.

In diphtheria, as a spray, to dissolve the false membrane; in hæmorrhage into the bladder, to dissolve clots; and other similar purposes. Of late trypsin has been used both internally and hypodermatically, in the treatment of cancer; and it would appear to have a distinct effect upon growing cancer cells when it can be brought in direct contact with them.

GROUP IV.—Emollient Substances.

Lard, Wool-fat, Spermaceti.

ADEPS.

LARD.—The prepared internal fat of the abdomen of the hog (*Sus scrofa*, var. *domesticus* Gray), purified by washing with water, melting, and straining. *Habita*[illegible]

CHARACTERS.—[illegible]lid, having a faint odor free from rancidity, an[illegible]*ty*.—Insoluble in water; very slightly soluble in [illegible]er, Chloroform, Carbon Disulphide or Pet[illegible]ut 0.917 at 25° C. (77° F.). It melts at 38° to [illegible] a perfectly clear liquid, which in thin layers is [illegible] an aqueous layer should not separate.

COMPOSITION.—[illegible] (2) *Stearin*. (3) *Palmitin*. Adeps Induratus [illegible] is ordinary lard deprived of a portion of its oil by [illegible] in hot climates when the high temperature renders ordinary lard too soft for use in ointments.

IMPURITIES.—Alkalies, chlorides, free fatty acids, cotton seed oil and other fats.

Preparations.

1. **Adeps Benzoinatus.**—Benzoinated Lard. Benzoin, 20; Lard, 1000; by melting and straining.

2. **Ceratum.**—Cerate. White Wax, 300; White Petrolatum, 200; Benzoated Lard, 500.

3. **Ceratum Resinæ.**—Rosin Cerate. Rosin, 350; Yellow Wax, 150; Lard, 500.

4. **Unguentum.**—Ointment. White Wax, 200; Benzoinated Lard, 800.

OLEUM ADIPIS.—Lard Oil. A fixed oil expressed from Lard at a low temperature.

CHARACTERS.—A colorless, or pale yellow oily liquid, having a peculiar odor and a bland taste. Sp. gr., 0.905 to 0.915. *Solubility*.—Almost insoluble in cold Alcohol; only slightly soluble in boiling Alcohol; easily soluble in Ether, Chloroform, Benzene and Carbon Dioxide.

COMPOSITION.—(1) *Olein*. (2) *Stearin*. (3) *Palmitin*.

ACTION.

Emollient.

USES.

Chiefly as a basis for ointments; by inunction for impaired

secretion of the skin, in chest affections, burns and acute cutaneous inflammations, and for the administration of mercury and other remedies.

ADEPS LANÆ.

WOOL-FAT.—The purified fat of the wool of sheep (*Ovis Aries* Linné), freed from water.

SOURCE.—Sheep's wool, washed with cold water, then subjected to heat and pressure, yields impure wool-fat. This is purified by melting, washing with alkali, and then washed with an acid while it is heated.

CHARACTERS.—A light-yellowish, tenacious, unctuous mass, having a slight, peculiar odor. *Solubility.*—Insoluble in, but miscible with, large quantities of water; sparingly soluble in cold Alcohol; more soluble in hot Alcohol; readily soluble in Ether and Chloroform.

COMPOSITION.—Before the separation of the fatty acids it consists of (1) *Cholesterin* and Isocholesterin, 70 per cent. (2) Fatty acids, 30 per cent.

IMPURITIES.—Alkalies, chlorides, free fatty acids, organic nitrogenous matter.

ADEPS LANÆ HYDROSUS.

HYDROUS WOOL-FAT. *Synonyms.*—Lanolin. Œsypum. The purified fat of the wool of sheep (*Ovis Aries* Linné), mixed with not more than 30 per cent. of water. *Habitat.*—Domesticated.

SOURCE.—Sheep's wool is treated with a weak soda solution, and the solution acidulated. The remaining wool is treated with Benzin, the liquid distilled, and the residue deprived of color by oxidizing agents, or sunlight.

CHARACTERS.—A yellowish-white or nearly white, ointment-like mass, having a faint, peculiar odor. *Solubility.*—Insoluble in water, but miscible with twice its weight of the latter, without losing its ointment-like character. It melts at about 40° C. (104° F.), and separates into an upper oily and a lower aqueous layer.

COMPOSITION.—Its chief constituents are—(1) *Cholesterin*, $C_{26}H_{43}$-(OH). (2) Ethers of Stearic, Palmitic, Oleic, Valerianic and other acids.

ACTION.

Emollient; hydrous wool-fat is more quickly absorbed than most fats.

USES.

Chiefly as a basis for ointments expected to act especially upon the skin; comedo; anhidrosis; ichthyosis, scleroderma and senile

atrophy of the skin; chapped hands and lips; burns and scalds; frost-bite; erysipelas; acute eczema; scarlet fever; it is well adapted for the inunction treatment of syphilis and as a vehicle for cocaine, morphine, atropine and other anodynes.

CETACEUM.

SPERMACETI. atty substance, obtained from the head of the sp *rocephalus* Linné. *Habitat.*— Pacific and Indi

CHARACTERS.— ent, slightly unctuous masses of a scaly, cryst lustre, with a very faint odor and a bland, m wish and rancid on prolonged exposure to air. lting point, 45° to 50° C. (113° to 122° F.). *Solu* and nearly so in cold Alcohol; soluble in about l; also in Ether, Chloroform, Carbon Disulphi only slightly soluble in cold Petroleum Benzin.

COMPOSITION.—It is mainly *Cetylic Alcohol*, $C_{16}H_{33}OH$, which in combination with *Palmitic Acid*, $HC_{16}H_{31}O_2$, forms a fat, *Cetin*, $C_{16}H_{33}C_{16}H_{31}O_2$.

IMPURITY.—Stearic acid.

Preparation.

Unguentum Aquæ Rosæ.—Ointment of Rose Water. Spermaciti, 125; White Wax, 120; Expressed Oil of Almond, 560; Stronger Rose Water, 190; Sodium Borate, 5.

ACTION.

Emollient; demulcent.

USES.

Chiefly as a basis for ointments and cerates.

GROUP V.—Drugs Which are Chiefly Used as Foods.

Cod Liver Oil, Sugar of Milk, Gelatin.

OLEUM MORRHUÆ.

COD LIVER OIL. *Synonym.*—Oleum Jecoris Aselli. A fixed oil obtained from the fresh livers of *Gadus Morrhua* Linné, and of other species of *Gadus*. *Habitat.*—North Atlantic Ocean. An oil obtained from the Candle fish (*Theleichthys Pacificus*) is found in the markets under the name of Eulachon Oil and is sometimes sold as Cod Liver Oil.

SOURCE.—The fresh livers are slowly heated, and the oil is decanted from the water, and sometimes deprived of the solid fat by partial freezing.

CHARACTERS.—A pale yellow, thin, oily liquid, having a peculiar, slightly fishy, but not rancid odor, and a bland, fishy taste. Sp. gr., 0.918 to 0.922. *Solubility.*—Very slightly soluble in Alcohol; readily soluble in Ether, Chloroform, or Carbon Disulphide; also in 2.5 parts of Acetic Ether.

COMPOSITION.—The chief constituents are—(1) *Olein*, 70 per cent., which is a fluid fixed oil, and is Glycerin Oleate, the most abundant constituent of Cod Liver Oil. (2) *Palmitin*, with some Stearin, 25 per cent. (3) Free fatty acids, as Oleic, Palmitic, Stearic. (4) *Gaduin*, $C_{35}H_{46}O_9$, a peculiar principle, very insoluble in ordinary menstrua. (5) *Morrhuol*, a crystalline substance of uncertain composition, containing Phosphorus, Iodine and Bromine. (6) Traces of Iodine and Bromine. (7) Biliary principles. The so-called alkaloids of Cod Liver Oil are decomposition products, ptomaines or cadaveric alkaloids and are found in larger quantities in the brown oils. Their existence in fresh oil obtained from healthy livers has not been demonstrated.

IMPURITIES.—Other fish oils, seal oil, free fatty acids.

Dose, 16 c.c. (4 fl. dr.).

Preparations.

1. **Emulsum Olei Morrhuæ.**—Emulsion of Cod Liver Oil. Rub Acacia, 125 gm., in a mortar with Cod Liver Oil, 500 c.c., add Water, 250 c.c., triturate, and add Syrup, 100 c.c. and Oil of Gaultheria, 4 c.c., with enough water to make 1000 c.c.

   Dose, 8 c.c. (2 fl. dr.).

2. **Emulsum Olei Morrhuæ Cum Hypophosphitibus.**—Emulsion of Cod Liver Oil with Hypophosphites. Cod Liver Oil, 500; Acacia, 125; Calcium Hypophosphite, 10; Potassium Hypophosphite, 5; Sodium Hypophosphite, 5; Syrup, 100; Oil of Gaultheria, 4. The Hypophosphites are dissolved in water, and the solution, mixed with Syrup, is gradually added to the emulsion with continued trituration.

   Dose, 8 c.c. (2 fl. dr.).

In both these Emulsions the Oil of Gaultheria may be replaced, if desired, by a suitable quantity of Oil of Bitter Almond, or other suitable flavoring.

ACTION.

Emollient; demulcent; roborant; alterative. It may cause, especially in large doses, eructations, nausea and possibly diarrhœa. As a fat which is readily absorbed and assimilated, its

continued use leads to a marked increase in weight and strength. Its special elements are believed to contribute to its medicinal value.

USES.

Externally, by rubbing it into the skin in wasting diseases and chronic cu ernally, especially in tuberculosis; chronic of strumous origin; tertiary syphilis; chronic itis and the wasting diseases of children.

ACTIS.

SUGAR OF M ic. $C_{12}H_{22}O_{11} + H_2O = 357.48$.
A peculiar crys m the whey of cow's milk by evaporation, and on.

CHARACTERS.—Wh asses, or a white powder feeling gritty on the tongue, odorless and having a faintly sweet taste. Permanent in the air. *Solubility.*—In 4.79 parts of water and in 1 part of boiling water; insoluble in Absolute Alcohol, Ether or Chloroform.

IMPURITIES.—Starch, cane sugar, heavy metals.

Sugar of Milk is used in Pulvis Ipecacuanhæ et Opii and Trituratio Elaterini.

ACTION.

It is a non-nitrogenous and bland nutrient, which is less apt to ferment in the alimentary tract than cane or grape sugar; it is said to be a very active diuretic, especially when cardiac dropsy is present.

USES.

As an excipient and diluent; for the sweetening of infants' food; as a carbohydrate food in phthisis and other wasting diseases; cardiac dropsy.

GELATINUM.

GELATIN.—The purified, air-dried product of the hydrolysis of certain animal tissues, as skin, ligaments and bones, by treatment with boiling water.

CHARACTERS.—An amorphous, more or less transparent solid, usually shredded or in thin sheets; colorless or with a slight yellowish tint, inodorous, and having a slight, characteristic, almost insipid taste. Unalterable in

the air when dry, but putrefying rapidly when moist or in solution. *Solubility.*—Insoluble in cold water, but swells and softens when immersed in it, gradually absorbing from 5 to 10 times its weight of water. It is soluble in boiling water, Acetic Acid, and Glycerin; insoluble in Alcohol, Ether, Chloroform, Benzene, Carbon Disulphide, and fixed and volatile oils. When dissolved in boiling water (1 in 50), it should solidify upon cooling, and form a transparent jelly. Its aqueous solution is precipitated by Tannic Acid.

Preparation.

Gelatinum Glycerinatum.—Glycerinated Gelatin. Gelatin, 100; Glycerin, 200; Water, a sufficient quantity. By solution with heat, and straining.

ACTION.

Styptic; demulcent; to some degree nutritive.

USES.

As a protective covering in certain diseases of the skin; in pharmacy as a basis for capsules, lozenges, bougies, suppositories and pessaries, and as a coating for pills.

GROUP VI.—The Organic Extracts.

Desiccated Thyroid Glands, Desiccated Suprarenal Glands, Testicular Extract, Pituitary Extract, Splenic Extract, Thymus Extract, Mammary Extract, Ovarian Extract.

GLANDULÆ THYROIDEÆ SICCÆ.—Desiccated Thyroid Glands. *Synonym.*—Thyroid Extract. The Thyroid Glands of the sheep (*Ovis Aries* Linné), freed from fat, and cleaned, dried and powdered.

SOURCE.—Remove the fat and connective tissue directly the sheep is killed. Reject cystic, hypertrophied or otherwise abnormal glands. Mince. Dry at 32.2° to 37.7° C. (90° to 100° F.). Powder the dried product. Remove all fat by washing with petroleum spirit and again dry.

CHARACTERS.—A yellowish amorphous, powder, having a slight, peculiar order, and containing the active ingredient of the thyroid tissue; partially soluble in water.

COMPOSITION.—The chief constituent is a proteid, which exists in the colloid matter and is called *Iodothyrin*, or *Thyroiodin;* it contains 9.3 per cent. of iodine and 0.5 per cent. of phosphorus.

IMPURITY.—Iodine compounds.

Dose, 0.250 gm. = 250 milligm. (4 gr.).

It is a powerful vaso-mo
cutaneous surface; large dose
and diarrhœa; it stimulates t
produces headache, restlessr
flushes, sweating, tremors, an
by the kidneys, and the quanti
by it; in induces a greatly incre

Us

Myxœdema; goitre (especia
variety); sporadic cretinism; art
tion; for promoting consolidation

GLANDULÆ SUPRA

DESICCATED SUPRARENAL (
Extract. The Suprarenal Glands of t
(*Bos Taurus* Linné), freed from fat, an

CHARACTERS.—A light, yellowish-br
slight, characteristic odor; partially solu

COMPOSITION.—The active principle,
exists only in the medulla of the gland
of a yellowish-white, stable, alkaline
bitter, and benumbing points of contact
in cold water, more soluble in hot water
acids and alkalies; and it forms salts
chloride and sul-

affecting the heart muscle in the same way as digitalis; it is a powerful vaso-contrictor and raises blood-pressure more than any other known substance; it increases the tone of all muscular tissue; it causes diminution of peristalsis and a depression of the respiratory centre, which may result in respiratory failure and death.

USES.

In minor surgery as a local vaso-constrictor; hay-fever (both internally and locally); nasal, pulmonary and gastric hæmorrhage; bronchitis; bronchial asthma; congestion and œdema of the lungs; cardiac diseases (here it should be employed with caution); Addison's disease; shock.

Unofficial Preparations.

Extractum Testiculare.—Testicular Extract. *Synonym.*—Testicular juice. It is prepared in the same way as other organic extracts.

Dose, .60 to 1.20 c.c.; 10 to 20 ♏, hypodermatically.

ACTION.

Under its use the functions of organic life are believed to be performed with renewed vigor.

USES.

Nervous diseases.

Extractum Pituitarium.—Pituitary Extract. Prepared in a manner similar to that adopted in the case of the other glands.

Dose, .20 to .30 c.c.; 3 to 5 gr.

ACTION.

It slightly stimulates the heart and contracts the blood-vessels, but is greatly inferior to suprarenal in this respect. Acromegaly has been found to be associated with disease of the pituitary body.

USES.

Chiefly in the treatment of acromegaly.

Extractum Splenicum.—Splenic Extract. Prepared in the same way as other glandular extracts.

Dose, .20 to .30 gm.; 3 to 5 gr.

ACTION.

Our knowledge of this is very limited. According to some observers, its intravenous injection causes in dogs an immediate fall of blood-pressure, followed later by a pronounced and continuing ise, which again is succeeded by a slow return to the normal. It has been pointed out that some secretion of the spleen posses ies. Given by the mouth in sufficient (lenic extract is apt to violently distur e much pain, nausea and vomiting, a natically, to cause marked local irritat

Exophthaln nsanity. It has also been proposed for tu d typhoid fever.

Extractum Thymiamum.—Thymus Extract. Preparations of the Thymus gland are made in a similar way to those of the Thyroid and Suprarenal.

Dose, .20 to .30 gm.; 3 to 5 gr.

ACTION.

From the fact that its greatest activity occurs during infancy and early childhood it has been inferred that the thymus is concerned in the formation of bone salts. It contains a greater amount of nuclein, and hence of phosphorus, than any other gland, and thymus extract is believed to be a reconstructive. It is thought to have also a hæmostatic action.

USES.

Goitre; exophthalmic goitre; rickets; malnutrition and defective development of children; chlorosis; leukæmia; phthisis; hæmophilia; hæmoptysis.

Extractum Mammarium.—Mammary Extract. Extract of the mammary gland is prepared in a manner similar to that of other glandular extracts.

Dose, .20 to .30 gm.; 3 to 5 gr.

ACTION.

It is believed to have some influence on the uterus.

Uses.

Uterine fibroma and carcinoma; menorrhagia; dysmenorrhœa; enlarged and sensitive uterus. It is very effective in delaying menstruation, especially in chlorotic girls.

Extractum Ovarianum.—Ovarian Extract. Prepared in a manner similar to that of other glandular extracts.

Dose, .20 to .30 gm.; 3 to 5 gr.

Action.

But little is known of its action. It appears to raise the blood-pressure, and in the castrated animal it increases oxidation.

Uses.

In the conditions following the functional loss of the ovaries either through operation or disease; amenorrhœa; climacteric disturbances; epilepsy connected with amenorrhœa or the climacteric; uterine fibroids; exophthalmic goitre.

GROUP VII.—The Serums and Antitoxins.

Antidiphtheritic Serum, Antitetanic Serum, Antistreptococcic Serum, Antipneumococcic Serum, Antivenomous Serum, Antiplague Serum, Anticholera Serum, Nutrient Serum, Hydrophobia Antidote.

SERUM ANTIDIPHTHERICUM.

ANTIDIPHTHERIC SERUM.—Diphtheria Antitoxin.—A fluid separated from the coagulated blood of a horse *Equus caballus* Linné, immunized through the inoculation of diphtheric toxin. It should be kept in sealed glass containers, in a dark place, at temperatures between 4.5° and 15° C. (40° and 49° F.).

Source.—Diphtheria bacilli are grown in a flask containing some nutrient broth (*e. g.*, meat broth), to which 0.5 per cent. of sodium chloride and 2 per cent. of commercial peptone have been added. At the end of some weeks the bacilli are filtered off, and the fluid left contains a large amount of diphtheria toxin, and it should be of such strength that .01 c.c. (1½ m.) of it will kill a good-sized guinea-pig. From .02 to 1.00 c.c. (3 to 15 m.) of it is aseptically injected into the jugular vein of a horse; this produces slight symptoms. As soon as they are past a larger dose is injected, and so the dose is gradually increased until 100 c.c. (25 fl. dr.) or more are given

at each injection. This leads to the formation of a large amount of antitoxin in the blood serum. At the end of some months the horse is bled to 8 litres (quarts) in a sterilized vessel, the blood coagulates, and the antitoxic serum is put into sterilized bottles and hermetically sealed, a little carbolic acid or other antiseptic being added to prevent decomposition.

The details may be modified, as horses vary in their reaction to the toxin, and toxins vary in strength, but the essentials of the method always remain the same.

CHARACTERS.- brown, transparent or slightly turbid liquid, oc or, due to the presence of the antiseptic used 1.025 to 1.040.

Antidiphthe power, the loss in one year varying betwe cent. Each container should be furnished ving the strength of the Anti-diphtheric Ser its, the name and percentage by volume of t servation of the liquid (if such be used), the da c Serum was last tested, and the date beyond strength indicated on the label or statement.

The standard of strength, expressed in units of antitoxic power, should be that approved or established by the United States Public Health and Marine Hospital Service.

In addition to the production of toxins, albumoses and an organic acid, the bacillus of diphtheria, at it develops in the body, induces the formation in the blood of a substance which is known as an antitoxin and is antidotal to the toxin of the bacillus. It is now believed that it is largely due to this substance that the system is enabled to resist the effects of the disease, and it has been demonstrated that if antitoxin is administered to the patient, sufficiently promptly to aid that which is formed in his body, it greatly promotes his chances of recovery.

Mode of Administration.—The antitoxic serum has been shown to be useless when given by the mouth, perhaps because it is destroyed in the liver. Therefore it is always injected subcutaneously; usually between the shoulders or on the side of the abdomen. Before injection the skin must be thoroughly washed with an antiseptic, and all ordinary antiseptic precautions should be taken. After injection the puncture should be healed with antiseptic gauze, iodoform and collodion. The antitoxin should be taken from a fresh bottle. A special syringe, so constructed that all the parts of it can be boiled before use, is employed.

Dose, 3000 units.

Immunizing dose for well persons, 500 units.

It is better to give a small dose of a concentrated rather than a large dose of a dilute antitoxin. The dose is the same for children and adults.

The strength of it, which is stated on the bottle, varies between 200 and 2500 units per cubic centimeter, but it is usually about 500. The quantity given and the repetition of the dose on the same day, or subsequent days, must depend largely upon the circumstances of the case. A unit is the smallest quantity of antitoxic serum, which when mixed with a certain quantity of a standard diphtheritic toxin and with it injected into the subcutaneous tissue of a healthy guinea-pig weighing from 250 to 300 grammes (8 to 10 oz.), protects the animal from death within four days.

It is impossible in a work like this to give a more precise definition, for all diphtheric toxin consists of a toxin proper, which is poisonous, and toxoid bodies which, although not poisonous, will neutralize the antitoxic properties of antitoxic serum. Therefore, to standardize antitoxic serum it must be tested against diphtheritic toxin in which the proportion of toxins proper and toxoids and the neutralizing activity of the latter as regards antitoxin are known and constant. Such a standard toxin is kept in the Government testing department in Berlin, and the strength of all diphtheritic antitoxins should be expressed in terms of this.

Action.

It has a favorable effect upon all the symptoms of diphtheria and also a marked influence in preventing the sudden occurrence of heart-failure which constitutes one of the great dangers of the disease; furthermore, the frequency of laryngeal diphtheria is diminished by its use.

Uses.

As the mortality of the disease when antitoxin is used increases in proportion to the lateness of its employment, the injection should be made at the earliest possible moment. The serum is also employed for immunizing purposes.

Unofficial Preparations.

Serum Antitetanicum.—Antitetanic Serum. This is prepared on the same principles as diphtheria antitoxin, and is administered in the same way or directly into the brain or spinal cord.

Dose, 10 to 20 c.c.; 2½ to 5 fl. dr.

Action.

While tetanus serum possesses antitoxic, it has no antibacterial, properties, and it naturally can have no effect upon destructive lesions which may be already present in the nerve centres.

USES.

In view of the extreme gravity of the disease, it would seem advisable to employ the serum freely at the earliest possible moment in every case of tetanus. The injections may be repeated every six or twelve hours at first, and afterwards at longer intervals if there i[illegible]nt. In some instances the antitoxin has [illegible]o the brain, after trephining the skull, [illegible]inal cord, and this is preferable in sev[illegible] of injury in which there appears to be [illegible]s will develop, the use of the serum as [illegible]e; for this remedy appears to be more u[illegible] as a curative agent.

It is a wel[illegible]s antitoxin has proved far less successful[illegible], and from some researches of great importance which have lately been published the following conclusions have been drawn: (1) Subcutaneous, intravenous and subdural injections of antitoxin are of no value as measures to relieve tetanus when the symptoms have appeared. (2) Injections of antitoxin, especially near the infected wound, will effectually bind any toxin present in the system; *i. e.*, toxin before it has been picked up by the motor end plates. (3) It is probable that injections of antitoxin directly into the motor nerve leading from the infected wound, or even into the segment of the cord reached by this nerve, will have some influence upon the toxin. The researches in question showed that while the toxin of tetanus is absorbed only by the motor nerves, the antitoxin is absorbed only by the circulation and lymph, and is not carried along the nerves.

Serum Antistreptococcicum.—Antistreptococcic Serum. Streptococci do not cause the diseases due to them by developing a toxin which circulates in the blood, but by their own presence throughout the body. In its efforts to antagonize their deleterious influence the system develops a toxin which is fatal to the streptococci, and it is for the purpose of reinforcing this toxin, so to speak, in its warfare against them that antistreptococcic serum is used. To prepare antistreptococcic serum the virulence

of the streptococci is increased by their passage through several rabbits; they are then grown on a medium which preserves their virulence. A horse is next treated with successive doses of cultivations of these living streptococci, each more potent than the former. At the end of the year the strength of the antitoxic serum of the horse is powerful enough for use. This is always given subcutaneously, and the dose varies with different specimens of serum.

Dose, 10 to 20 c.c.; 2½ to 5 fl. dr.

ACTION.

The chief beneficial effects from its employment are a fall in temperature and a general improvement in the patient's condition. It labors under the disadvantage that different cultivations of apparently the same streptococcus show such variance that serum which is bactericidal to one cultivation may not be so to another.

USES.

It has been employed in various diseases in which infection is largely attributed to the streptococcus, such as erysipelas, malignant endocarditis, otitis media, thrombosis of the lateral sinus, and puerperal and surgical septicæmia, and trial may be made of it in any affection attended with the presence of streptococci. Some observers have reported good results from it in severe scarlet fever.

Serum Antipneumococcicum. — Antipneumococcic Serum. This is prepared in the same way as antistreptococcic serum.

Dose, 10 to 20 c.c.; 2½ to 5 fl. dr.

ACTION.

It is antibacterial, but does not appear to possess antitoxic properties. As in the case of antistreptococcic serum, there are serious difficulties in its practical application, and the results thus far obtained have not been very satisfactory.

USES.

For diseases due to the pneumococcus; the serum is injected subcutaneously, and it is advised that the doses should be given

twice daily until the temperature has subsided and the patient is convalescent.

Serum Antivenenosum.—Antivenomous Serum. *Synonym.*—Antivenene. The poison of all venomous snakes is apparently the same. Horses are rendered immune to snake poison by repeated [illegible], and the serum is prepared in the same [illegible].

Dose, [illegible] dr.

[illegible]ON.

The ser[illegible]nimals when employed before, at the san[illegible] inoculation with snake poison; the immun[illegible]ever, is found not to last longer than six days.

USES.

The serum should be administered as soon as possible after the bite. It may be given subcutaneously, but, on account of the greater rapidity of absorption, it is preferable to inject it into a vein, due antiseptic precautions being taken. The results of this treatment thus far recorded leave no doubt of its extreme value.

Serum Antipestilens.—Antiplague Serum.—Prepared in the same way as the other inoculations.

Dose, 10 to 20 c.c.; 2½ to 5 fl. dr.

ACTION.

The serum is antibacterial; if, as is said to be the case, it also possesses antitoxic properties, these seem to vary with the method of preparation, and are certainly less pronounced than the antibacterial. When the prophylactic vaccine is used, in from three to five hours after the inoculation there is a marked rise of temperature (lasting from twenty-four to thirty-six hours), with pain and swelling at the site of inoculation.

USES.

Of the antiplague serum, which is injected subcutaneously, two or three doses should be given the first day, and one dose daily

afterward; the results from its use have not thus far been very encouraging. The prophylactic vaccine should be injected, with strict antiseptic precautions, into the subcutaneous tissue, preferably of the arm; from an extensive use of this vaccine, particularly in India, its efficacy against plague appears to be clearly established.

Serum Anticholeraicum.—Anticholera Serum. This is prepared in a manner similar to other vaccines.

Dose, 10 to 20 c.c.; 2½ to 5 dr.

ACTION.

The serum is antibacterial but not antitoxic. Two prophylactic vaccines have been used, one consisting of an emulsion in sterile broth of a fresh agar cultivation of virulent vibrios, and the other of an emulsion in sterile broth made from attenuated vibrios. One vaccine is used five days, or more, after the other, and they are injected into the subcutaneous tissue of the abdomen. There is a moderate, but brief febrile reaction after the first vaccination, and a less marked one after the second.

USES.

As the serum has no antitoxic properties, and as the disease runs such a rapid course, the serum does not appear to have any value in the treatment of cholera. On the other hand, prophylactic vaccination probably affords considerable protection against the disease.

Serum Antityphoideum.—Antityphoid Serum. This serum is prepared by a method similar to that employed for other vaccines.

ACTION.

The prophylactic inoculation is made, with strict antiseptic precautions, into the subcutaneous tissue of the abdomen. It is followed in three or four hours by local inflammatory action and by pyrexia which usually subsides within twelve hours.

USES.

It is advisable that the injection for prophylactic purposes should be made in the evening, so that the patient may go to bed

as soon as the symptoms make their appearance; in order to secure the best chance of success the inoculation should be repeated in a week. At present no definite conclusions can be reached as to the immunizing power of this method, but the inoculation appears to exercise a pronounced influence on the system, since it renders the blood serum capable of agglutinating typhoid bacilli. Cases been reported from time to time in whic s been employed, but there is as yet no pe treatment is of benefit.

Serum From natural sources.
Dose, 3.

The injection into the subcutaneous tissue, it has been found, of small quantities of serum, by increasing the katabolism of the body, induces an increase of urinary nitrogen and a loss of weight, but when large quantities are employed, the loss from the increased katabolism caused is more than offset by the utilization of the serum as a food. Furthermore, if the serum be heated to 65° C. (149° F.) this has the effect of destroying the bodies which produce increased katabolism, while the nutritive value of the serum remains unimpaired.

Uses.

A horse-serum or sheep-serum, heated to the proper temperature, may be injected into the loose subcutaneous tissues in a variety of conditions, as, after grave abdominal operations, when it is impossible or unadvisable to feed the patient by the mouth or rectum, in the regurgitation sometimes met with in post-diphtheritic paralysis, or in certain cases of gastric ulcer, typhoid fever, infantile diarrhœa, etc.

Antidotum Rabiis.—Hydrophobia Antidote. A rabbit is inoculated from the spinal cord of an animal dead of hydrophobia, other rabbits are inoculated from this, and so through a series until the spinal cord (which is the chief seat of the virus in hydrophobia) contains a virus the incubation period of which is

seven days. The spinal cord loses it virulence when exposed to the air, so that a series of spinal cords (each of which originally contained a virus the incubation period of which was seven days) can be prepared of greater or less virulence according to the time during which they have been exposed to the air.

ACTION.

A series of inoculations from such spinal cords is supposed to counteract the result of infection from an animal suffering from rabies.

USES.

As a prophylactic injection. It is very doubtful, however, if hydrophobia, as a morbid entity, exists. Most of the deaths in man ascribed to this disease have been proven to have been due to other causes, as tetanus, etc. If hydrophobia exist, it is of extreme rarity, and it can be said that most of the cases reported are instances of hydrophobia-phobia.

GROUP VIII.—Drugs Used for Coloring Agents.

Cochineal.

COCCUS.

COCHINEAL. *Synonyms.*—Cochineal Bug. Red Scale Insect. The dried female of *Pseudococcus cacti* (Linné) Burmeister. *Habitat.*—Mexico and Central America; upon *Opuntia cochinillifera* Miller and other species.

CHARACTERS.—About 5 mm. long, somewhat oblong and angular in outline, flat and concave beneath, convex above; externally purplish-gray or purplish-black; transversely wrinkled; easily pulverizable, yielding a dark red powder; odor faint; taste slightly bitter.

COMPOSITION.—The chief constituents are—(1) *Carminic Acid*, $C_{17}H_{18}O_{10}$, 10 per cent., a glucoside. (2) Coccerin, a wax. (3) Fat, consisting of myristin, and fatty acids. Sulphuric acid and several other reagents precipitate from its decoction the well-known coloring matter, carmine.

Cochineal is contained in Tinctura Cardamomi Composita.

ACTION.

Probably none.

USES.

Only as a coloring agent.

GROUP IX.—Drugs Whose Action is Mechanical.

Prepared Suet, Stearic Acid, Wax, Cantharides, Ichthyol.

SEVUM PRÆPARATUM.

PREPARED SUET. *Synonym.*—Mutton Suet. The internal fat of the abdomen of the sheep, *Ovis Aries* Linné, purified by melting and straining. *Habitat.*—Domesticated.

CHARACTERS.— inodorous, and having a bland taste when fres prolonged exposure to the air. *Solubility.*—Ins ol; soluble in 44 parts of boiling Alcohol, in abou y in 2 parts of Petroleum Benzin.

COMPOSITIO are—(1) *Stearin.* (2) *Palmitin.* (3) *Olein*

Prepared Su m Hydrargyri.

Emollient.

USES.

Chiefly in the preparation of cerates.

ACIDUM STEARICUM.

STEARIC ACID.—$HC_{18}H_{35}O_2 = 282.14$. A monobasic, organic acid ($C_{17}H_{35} \cdot COOH$), in its commercial, more or less impure form, usually obtained from the more solid fats, chiefly tallow.

SOURCE.—By boiling the fats with soda-lye, the Stearin is decomposed, Sodium Stearate being formed with the liberation of Glycerin. $C_3H_5(C_{18}H_{35}O_2)_3 + 3NaOH = C_3H_5(OH)_3 + 3NaC_{18}H_{35}O_2$. The soap is decomposed by heating with water and Sulphuric Acid, setting free the fatty acids which are removed and purified with hot Alcohol. On cooling, Stearic Acid will separate.

CHARACTERS.—A hard, white, somewhat glossy solid, odorless and tasteless, and permanent in the air. *Solubility.*—Insoluble in water; soluble in about 16.6 parts of Alcohol; readily soluble in boiling Alcohol and in Ether.

IMPURITY.—Undecomposed fat.

ZINCI STEARAS.—Zinc Stearate.

SOURCE.—Zinc Acetate or Sulphate, dissolved in water, is heated and added to Potassium Stearate, and the precipitate washed and dried.

CHARACTERS.—A very fine, white powder, tasteless, and having a very faint odor, resembling that of fat. It contains a small but varying proportion of Zinc Palmitate. It is insoluble in water, Alcohol or Ether.

IMPURITIES.—Chlorides, alkalies, alkali earths.

Preparation.

Unguentum Zinci Stearatis.—Ointment of Zinc Stearate. Zinc Stearate, 50; White Petrolatum, 50.

ACTION.

It has no known general action upon man.

USES.

In the manufacture of glycerin suppositories; diseases of the skin and mucous membranes in combination with zinc or copper in the form of stearates.

CERA.

CERA FLAVA.—Yellow Wax. A solid substance prepared from the honey-comb of the bee, *Apis mellifera* Linné.

CHARACTERS.—A yellowish to brownish-yellow solid, having an agreeable, honey-like odor, and faint balsamic taste. Sp. gr., 0.951 to 0.960. *Solubility.*—Insoluble in water; sparingly soluble in cold Alcohol; boiling Alcohol dissolves the Cerotic Acid and a portion of the Myricin; completely soluble in Ether, Chloroform, and fixed and volatile oils.

COMPOSITION.—The principal constituents are—(1) Hydrocarbons (probably $C_{27}H_{56}$ and $C_{34}H_{64}$) about 12 per cent. (2) *Cerin* or Cerotic Acid, $C_{27}H_{54}O_2$. (3) *Myricin* or Myrical Palmitate, $C_{30}H_{61}$, $C_{16}H_{31}O_2$, the principal constituent. (4) An Alcohol, $C_{25}H_{52}O$, in small quantities. (5) *Cerylic Alcohol*, $C_{27}H_{56}O$.

IMPURITIES.—Fats, fatty acids, Japan wax, rosin, soap, paraffin, ceresin.

Yellow Wax is used in Ceratum Cantharidis, Ceratum Resinæ, Ceratum Resinæ Compositum, and Unguentum Picis Liquidæ.

CERA ALBA.—White Wax.

SOURCE.—Made by bleaching yellow wax by exposure to moisture, air and light.

CHARACTERS.—A yellowish-white solid, somewhat translucent in thin layers, having a faint, characteristic odor, and nearly tasteless. Sp. gr., 0.950 to 0.960.

COMPOSITION.—As of yellow wax.

White Wax is used in Ceratum, Ceratum Camphoræ, Unguentum, and Unguentum Aquæ Rosæ.

ACTION.

None.

USES.

Only as a basis for various plasters, cerates and ointments.

CANTHARIS.

CANTHARIDES. *Synonyms.*—Spanish or Blister Beetles. The beetle, *Cantharis vesicatoria* (Linné) De Geer, thoroughly dried at a temperature not exceeding 40° C. (104° F.). *Habitat.*—Southern and Central Europe, mainly on Oleaceæ and Caprifoliaceæ.

CHARACTERS.—From 18 to 25 mm. long, about 6 mm. broad; flattish-cylindrical, with filiform antennæ; black in the upper part, with two long wing-sheaths and ample membranous, transparent brownish wings; elsewhere of a shining coppery-green color; odor strong and disagreeable; taste slight, afterwards acrid.

Powder grayish-brown, with shining green particles; contains few or no hairs.

COMPOSITION.—The chief constituents are—(1) *Cantharidin*, $C_{10}H_{12}O_4$, 0.4 to 1 per cent., the active principle, a crystallizable body forming colorless plates, soluble in Alcohol, Ether, Acetic Ether, Glacial Acetic Acid, Chloroform, and oils. It is found especially in the generative apparatus, the eggs, and the blood. (2) A volatile oil giving the odor and said to have the same action as Cantharidin. (3) A green oil, the coloring principle, closely allied to chlorophyll. (4) Various extractives and salts.

Dose, 0.030 gm. = 30 milligm. (½ gr.).

Preparations.

1. **Ceratum Cantharidis.**—Cantharides Cerate. Cantharides, 320; Liquid Petrolatum, 150; Yellow Wax, 180; Rosin, 180; Lard, 170.

2. **Collodium Cantharidatum.**—Cantharidal Collodion. Cantharides, 60; by percolation with Chloroform, evaporation and solution of residue in Flexible Collodion, 85.

3. **Tinctura Cantharidis.**—Tincture of Cantharides. Cantharides, 100; by percolation and maceration with Alcohol to 1000.

Dose, 0.3 c.c. (5 ♏).

ACTION.

It is a powerful irritant and counter-irritant, producing vesication on the skin; but its local action is slower and more superficial, as well as less painful, than that of most irritants. In sufficient doses it causes gastro-enteritis, with collapse, which may prove fatal. Cantharidin is absorbed from the alimentary canal and to a less extent from the skin, and will exert its irritant action elsewhere, especially upon the organs of excretion. The effect upon the kidneys is seen in diuresis, and when a larger

amount is absorbed, in nephritis, with albuminuria and hæmaturia, and in intense irritation of the bladder and urethra, constituting the condition known as strangury. Erotic excitement is apt to be caused, and there may also be swelling and inflammation of the external genitals.

Uses.

It is the most commonly employed and satisfactory vesicant in use. Blisters serve to relieve pain, reduce inflammation, and promote the absorption of inflammatory products, and although not in such general use as formerly, are resorted to in a great variety of conditions. Cantharides is also very generally employed in the treatment of loss of hair. Internally it is chiefly used as a stimulant to the urinary and genital organs in such conditions as hæmaturia, incontinence of urine, chronic pyelitis, chronic cystitis, irritability of the bladder, gleet, prostatorrhœa, spermatorrhœa and impotence.

Toxicology.—Empty the stomach by emetics, or wash out with the stomach pump; mucilaginous and demulcent liquids; opium.

Unofficial Preparation.

Ichthyolum.—Ichthyol. *Synonym.*—Ammonium Ichthyolsulphonate.

Source.—A bituminous quartz containing the fossil remains of fish is distilled with concentrated Sulphuric Acid, and the distillate is treated with a concentrated solution of Sodium Chloride, whereby the Sulphuric and Sulphurous Acids are removed. The distillate is then saturated with Ammonia.

Characters.—A viscous, reddish-brown, almost black substance, having a tarry odor and containing 15 per cent. of Sulphur. *Solubility.*—Soluble in Water, Glycerin, Oils and Fats. **Dose, .60 to 1.20 gm.; 10 to 20 gr.**

Lithium, Sodium, and Zinc Ichthyolsulphonates are prepared. The name Ichthyol is understood to refer to the Ammonium Salt.

Action.

Mildly irritant to the skin; in large doses it causes gastro-intestinal irritation; it is an active reducing agent.

Uses.

Chiefly as a local application in skin diseases, especially chronic eczema, psoriasis, acne rosacea, and erysipelas; ulcers of the leg; burns; chronic prostatitis (by suppository); inflamed and rheumatic joints; indurated glands and swellings; chronic inflammations of the pelvic viscera; in gynæcological practice. Internally, it is doubt[illegible]cal value.

APPENDIX.

ORGANIC DRUGS ARRANGED ACCORDING TO THEIR NATURAL ORDERS.

1. The Vegetable Drugs.

Family.	*Name of Plant.*	*Part Used.*	*Name of Drug.*
1. Gigartinaceæ.	Chondrus crispus.	Plant.	Irish moss.
2. Hypocraceæ.	Claviceps purpurea.	Sclerotium.	Ergot.[1]
3. Filices.	Dryopteris Filix-mas.	Rhizome.	Male fern.
	Dryopteris marginalis.	Rhizome.	Male fern.
4. Lycopodiaceæ.	Lycopodium clavatum.	Spores.	Lycopodium.
5. Pinaceæ (Coniferæ)	Pinus palustris.	Oleoresin.	Turpentine.
	Pinus palustris.	Product from distillation of wood.	Tar.
	Pinus pumilio.	Oil from leaves.	Oil of pine.
	Abies balsamea.	Oleoresin from bark.	Canada turpentine.
	Juniperus communis.	Oil from fruit.	Oil of juniper.
	Juniperus Oxycedrus.	Product from distillation of wood.	Oil of cade.
	Juniperus Sabina.	Tops.	Savin.
6. Gramineæ.	Saccharum officinarum.	Refined sugar.	Sugar.[2]
	Zea Mays.	Starch grains from fruit.	Starch.
	Zea Mays.	Styles and stigmas.	Corn-silk.
	Hordeum distichon.	Grain, partially germinated.	Malt.
	Agropyron repens.	Rhizome.	Couch-grass.
	Secale cereale.	Fungus replacing the grain.	Ergot.[3]
7. Palmæ.	Serenoa serrulata.	Fruit.	Sabal.
8. Araceæ.	Acorus Calamus.	Rhizome.	Sweet flag.
9. Liliaceæ.	Aloe Chinensis.	Juice of leaves.	Aloes.
	Aloe Perryi.	Juice of leaves.	Aloes.
	Aloe vera.	Juice of leaves.	Aloes.
	Urginea maritima.	Bulb.	Squill.
	Colchicum autumnale.	Corm.	Colchicum corm.
	Colchicum autumnale.	Seed.	Colchicum seed.
	Veratrum album.	Rhizome and roots.	Veratrum.
	Veratrum viride.	Rhizome and roots.	Veratrum.
	Asagræa officinalis.	Alkaloids from seed.	Veratrine.
	Convallaria majalis.	Rhizome and roots.	Convallaria.
	Smilax medica.	Root.	Sarsaparilla.
	Smilax officinalis.	Root.	Sarsaparilla.
	Smilax ornata.	Root.	Sarsaparilla.
	Smilax papyracea.	Root.	Sarsaparilla.
10. Zingiberaceæ.	Zingiber officinale.	Rhizome.	Ginger.
	Elettaria repens.	Fruit.	Cardamom.
11. Orchidaceæ.	Cypripedium hirsutum.	Rhizome and roots.	Ladies' slipper.

[1] See also Family No. 6, *Gramineæ*.
[2] See also Family No. 21, *Chenopodiaceæ*.
[3] See also Family No. 2, *Hypocraceæ*.

Family.	*Name of Plant.*	*Part Used.*	*Name of Drug.*
11. Orchidaceæ.	Cypripedium parviflorum.	Rhizome and roots.	Ladies' slipper.
	Vanilla planifolia.	Fruit.	Vanilla.
12. Piperaceæ.	Piper Cubeba.	Fruit.	Cubeb.
	Piper nigrum.	Fruit.	Black pepper.
	Piper angustifolium.	Leaves.	Matico.
13. Salicaceæ.	Salix (*several species*).	Glucoside.	Salicin.
	Populus (*several species*).	Glucoside.	Salicin.
14. Betulaceæ.	Betula lenta.	Oil from bark.	Oil of betula.
15. Fagaceæ (Cupuliferæ).	Quercus alba.	Bark.	White oak.
	Quercus infectoria.	Parasitic excrescences.	Nutgall.
	Fagus ferruginea.	Derivatives from wood-tar.	Creosote.
	Fagus sylvatica.	Derivatives from wood-tar.	Creosote.
16. Ulmaceæ.	Ulmus fulva.	Bark.	Slippery elm.
17. Moraceæ.	Cannabis sativa.	Flowering tops.	Indian cannabis.
	Humulus Lupulus.	Strobiles.	Hops.
	Ficus carica.	Fruit.	Fig.
18. Santalaceæ.	Santalum album.	Oil from wood.	Oil of santal.
19. Aristolochiaceæ.	Aristolochia reticulata.	Rhizome and roots.	Serpentaria.
	Aristolochia Serpentaria.	Rhizome and roots.	Serpentaria.
20. Polygonaceæ.	Rheum officinale.	Rhizome.	Rhubarb.
	Rheum palmatum.	Rhizome.	Rhubarb.
	Rheum tanguticum	Rhizome	Rhubarb.
21. Chenopodiaceæ.	Chenopodium anthelminticum.	Fruit and oil.	American wormseed
	Beta vulgaris.	Refined sugar.	Sugar.[1]
22. Phytolaccaceæ.	Phytolacca decandra.	Root.	Poke root.
23. Myristicaceæ.	Myristica fragrans.	Kernel of seed.	Myristica.
24. Ranunculaceæ.	Aconitum Napellus.	Tuberous root.	Aconite.
	Hydrastis canadensis	Rhizome and roots.	Hydrastis.
	Adonis vernalis.	Glucoside.	Adonidin.
	Delphinium Staphisagria.	Seed.	Stavesacre.
	Cimicifuga racemosa.	Rhizome and roots.	Cimicifuga.
25. Berberidaceæ.	Podophyllum peltatum.	Rhizome.	May apple.
	Berberis aquifolium.	Rhizome and roots.	Berberis.
26. Menispermaceæ.	Jateorhiza palmata.	Root.	Calumba.
	Chondrodendron tomentosum.	Root.	Pareira.
	Anamirta paniculata.	Neutral principle from seed.	Picrotoxin.
27. Lauraceæ.	Cinnamomum Camphora.	Ketone.	Camphor.
	Cinnamomum — *sp. indeter.*	Bark.	Saigon cinnamon.
	Cinnamomum zeylanicum.	Inner bark of shoots.	Ceylon cinnamon.
	Sassafras variifolium.	Bark of root.	Sassafras.
	Sassafras variifolium.	Pith.	Sassafras pith.
28. Papaveraceæ.	Papaver somniferum.	Exudation from capsules.	Opium.
	Sanguinaria canadensis.	Rhizome.	Bloodroot.
29. Cruciferæ.	Sinapis alba.	Seed.	White mustard.
	Brassica nigra.	Seed.	Black mustard.
30. Hamamelidaceæ.	Liquidambar orientalis.	Balsam from wood and inner bark.	Storax.
	Hamamelis virginiana.	Bark and twigs.	Hamamelis bark.
	Hamamelis virginiana.	Leaves.	Hamamelis leaves.

[1] See Family No. 6, *Gramineæ*.

Family.	*Name of Plant.*	*Part Used.*	*Name of Drug.*
31. Rosaceæ.	Hagenia abyssinica.	Panicles of pistillate flowers.	Kousso.
	Prunus serotina.	Bark.	Wild cherry.
	Prunus Amygdalus, *var.* amara.	Seed.	Bitter almond.
	Prunus Amygdalus, *var.* dulcis.	Seed.	Sweet almond.
	Prunus laurocerasus.	Fresh leaves.	Cherry laurel.
	Prunus domestica.	Fruit.	Prune.
	Rubus cuneifolius.	Bark of rhizome.	Blackberry.
	Rubus nigrobaccus.	Bark of rhizome.	Blackberry.
	Rubus villosus.	Bark of rhizome.	Blackberry.
	Rosa gallica.	Petals.	Red rose.
	Rosa damascena.	Oil from flowers.	Oil of rose.
	Quillaja Saponaria.	Bark.	Soap bark.
32. Leguminosæ.	Cassia acutifolia.	Leaflets.	Senna.
	Cassia angustifolia.	Leaflets.	Senna.
	Cassia Fistula.	Fruit.	Purging cassia.
	Copaiba, *sp. indeter.*	Oleoresin.	Copaiba.
	Pterocarpus Marsupium.	Inspissated juice.	Kino.
	Pterocarpus santalinus.	Heart-wood.	Red saunders.
	Toluifera Pereiræ.	Balsam.	Balsam of Peru.
	Toluifera Balsamum.	Balsam.	Balsam of tolu.
	Cytisus Scoparius.	Tops.	Broom.
	Physostigma venenosum.	Seed.	Calabar bean.
	Vouacpoua Araroba.	Neutral principle deposited in wood.	Chrysarobin.
	Erythrophlœum guineense.	Bark.	Sassy bark.
	Hæmatoxylon campechianum.	Heart-wood.	Log wood.
	Glycyrrhiza glabra.	Rhizome and root.	Spanish licorice.
	Glycyrrhiza glandulifera.	Rhizome and root.	Russian licorice.
	Acacia Senegal.	Gummy exudation.	Gum Arabic.
	Astragalus gummifer.	Gummy exudation.	Tragacanth.
	Tamarindus indica.	Pulp of fruit.	Tamarind.
33. Keameriaceæ.	Krameria argentea.	Root.	Rhatany.
	Krameria Ixina.	Root.	Rhatany.
	Krameria triandra.	Root.	Rhatany.
34. Geraniaceæ.	Geranium maculatum.	Rhizome.	Cranesbill.
35. Linaceæ.	Linum usitatissimum.	Seed and oil.	Linseed.
36. Erythroxylaceæ.	Erythroxylon Coca.	Leaves.	Huanuco coca.
	Erythroxylon Truxillense.	Leaves.	Truxillo coca.
37. Zygophyllaceæ.	Guaiacum officinale.	Resin of wood.	Guaiac
	Guaiacum sanctum.	Resin of wood.	Guaiac
38. Rutaceæ.	Pilocarpus Jaborandi.	Leaflets.	Jaborandi.
	Pilocarpus microphyllus.	Leaflets.	Jaborandi.
	Barosma betulina.	Leaves.	Buchu.
	Xanthoxylum americanum.	Bark.	Northern prickly ash.
	Fagara Clava-Herculis.	Bark.	Southern prickly ash.
	Citrus Aurantium.	Outer rind of fruit.	Sweet orange peel.
	Citrus vulgaris.	Rind of fruit.	Bitter orange peel.
	Citrus Limonum.	Outer rind of fruit.	Lemon peel.
	Citrus Limonum.	Juice of fruit.	Lemon juice.
39. Simarubaceæ.	Picrasma excelsa.	Wood.	Jamaica quassia.
	Quassia amara.	Wood.	Surinam quassia.
40. Meliaceæ.	Sycocarpus Rusbyi.	Bark.	Cocillaña.
41. Burseraceæ.	Commiphora Myrrha.	Gum-resin.	Myrrh.
42. Polygalaceæ.	Polygala Senega.	Root.	Senega.
43. Euphorbiaceæ.	Ricinus communis.	Oil from seed.	Castor oil.
	Croton Tiglium.	Oil from seed.	Croton oil.

Family.	*Name of Plant.*	*Part Used.*	*Name of Drug.*
43. Euphorbiaceæ.	Mallotus philippinensis.	Glands and hairs from capsules.	Kamala.
	Stillingia sylvatica.	Root.	Queen's root.
	Hevea (*several species*).	Milk-juice.	Rubber.
44. Anacardiaceæ.	Rhus glabra.	Fruit.	Rhus glabra.
	Pistacia Lentiscus.	Resinous exudation.	Mastic.
45. Celastraceæ.	Euonymus atropurpureus.	Bark of root.	Euonymus.
46. Sapindaceæ.	Paullinia Cupana.	Seeds.	Guarana.
47. Rhamnaceæ.	Rhamnus Frangula.	Bark.	Frangula.
	Rhamnus Purshiana.	Bark.	Cascara sagrada.
48. Vitaceæ.	Vitis vinifera.	From juice of fruit.	White wine.
	Vitis vinifera.	From juice of fruit.	Red wine.
49. Malvaceæ.	Gossypium herbaceum.	Bark of root.	Cotton root bark.
	Gossypium herbaceum.	Hairs of seed.	Purified cotton.
	Gossypium herbaceum.	Oil from seed.	Cotton seed oil.
	Althæa officinalis.	Root.	Marshmallow.
50. Sterculiaceæ.	Theobroma Cacao.	Oil from seed.	Oil of theobroma.
51. Ternstrœmiaceæ.	Thea sinensis.	Feebly basic substance from leaves.	Caffeine.[1]
52. Guttiferæ.	Garcinia Hanburii.	Gum-resin.	Gamboge.
53. Cactaceæ.	Cactus grandiflorus.	Stems.	Cactus.
54. Thymeleaceæ.	Daphne Mezereum.	Bark.	Mezereum.
55. Punicaceæ.	Punica Granatum.	Bark of stem and root	Pomegranate.
56. Myrtaceæ.	Eucalyptus globulus.	Leaves and oil.	Eucalyptus.
	Eucalyptus rostrata.	Exudation from bark.	Eucalyptus gum.
	Eugenia aromatica.	Flower buds and oil.	Cloves.
	Melaleuca Leucadendron.	Oil from leaves.	Oil of cajuput.
	Pimenta officinalis.	Fruit and oil.	Allspice.
57. Umbelliferæ.	Ferula fœtida.	Gum-resin from root.	Asafetida.
	Undetermined.	Rhizome and root.	Sumbul.
	Petroselinum sativum.	Fruit.	Apiol.
	Conium maculatum.	Fruit.	Hemlock.
	Pimpinella Anisum.	Fruit and oil.	Anise.
	Coriandrum sativum.	Fruit and oil.	Coriander.
	Fœniculum vulgare.	Fruit and oil.	Fennel.
	Carum Carvi.	Fruit and oil.	Caraway.
58. Ericaceæ.	Gaultheria procumbens.	Oil from leaves.	Oil of wintergreen.
	Arctostaphylos Uva-ursi.	Leaves.	Uva ursi.
	Chimaphila umbellata.	Leaves.	Pipsissewa.
59. Styraceæ.	Styrax Benzoin.	Balsamic resin.	Benzoin.
60. Oleaceæ.	Olea europæa.	Oil from fruit.	Olive oil.
	Fraxinus Ornus.	Exudation.	Manna.
61. Loganiaceæ.	Strychnos Nux-vomica.	Seed.	Nux vomica.
	Strychnos *sp. indeter.*	Extract of bark.	Curare.
	Gelsemium sempervirens.	Rhizome and roots.	Gelsemium.
	Spigelia marilandica.	Rhizome and roots.	Spigelia.
62. Gentianaceæ.	Gentiana lutea.	Root.	Gentian.
	Swertia Chirayita.	Plant.	Chirata.
63. Apocynaceæ.	Strophanthus Kombé.	Seed.	Strophanthus.
	Apocynum cannabinum.	Rhizome.	Canadian hemp.
64. Convolvulaceæ.	Exogonium Purga.	Tuberous root.	Jalap.
	Convolvulus Scammonia.	Gum-resin.	Scammony.
65. Hydrophyllaceæ.	Eriodictyon californicum.	Leaves.	Eriodictyon.

[1] See also Family No. 69, *Rubiaceæ*.

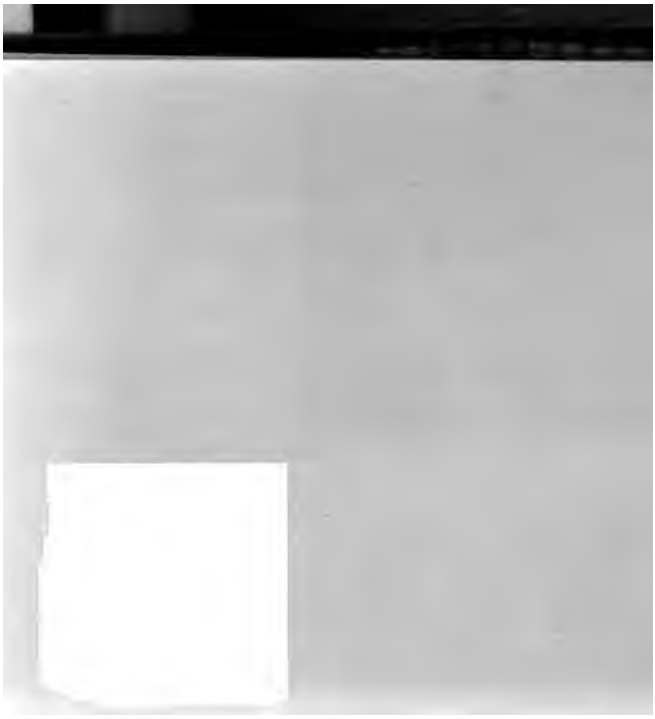
Family.	*Name of Plant.*	*Part Used.*	*Name of Drug.*
66. Labiatæ (Lamiaceæ).	Mentha piperita.	Leaves and flowering tops; oil.	Peppermint.
	Mentha spicata.	Leaves and flowering tops; oil.	Spearmint.
	Mentha piperita.	Secondary alcohol from oil.	Menthol.
	Thymus vulgaris.	Phenol from oil.	Thymol.
	Thymus vulgaris.	Oil from leaves and flowering tops.	Oil of thyme.
	Lavandula officinalis.	Oil from flowering tops.	Oil of lavender flowers.
	Rosmarinus officinalis.	Oil from flowering tops.	Oil of rosemary.
	Salvia officinalis.	Leaves.	Sage.
	Hedeoma pulegioides.	Leaves and flowering tops; oil.	Pennyroyal.
	Marrubium vulgare.	Leaves and flowering tops.	Horehound.
	Scutellaria lateriflora.	Plant.	Skullcap.
67. Solanaceæ.	Atropa Belladonna.	Root and leaves.	Belladonna.
	Hyoscyamus niger.	Leaves and flowering tops.	Henbane.
	Scopola Carniolica.	Rhizome.	Scopola.
	Datura Stramonium.	Leaves.	Stramonium.
	Capsicum fastigiatum.	Fruit.	Capsicum.
	Fabiana imbricata.	Branches.	Pichi.
68. Scrophulariaceæ.	Digitalis purpurea.	Leaves.	Digitalis.
	Veronica virginica.	Rhizome and roots.	Leptandra.
69. Rubiaceæ.	Cinchona Calisaya.	Bark.	Cinchona.
	Cinchona Ledgeriana.	Bark.	Cinchona.
	Cinchona officinalis.	Bark.	Cinchona.
	Cinchona succirubra.	Bark.	Red cinchona.
	Cephaëlis acuminata.	Root.	Carthagena ipecac.
	Cephaëlis Ipecacuanha.	Root.	Rio ipecac.
	Ourouparia Gambir.	Extract from leaves and twigs.	Gambir.
	Coffea arabica.	Feebly basic substance from seeds.	Caffeine.[1]
70. Caprifoliaceæ.	Viburnum prunifolium.	Bark of root.	Black haw.
	Viburnum Lentago.	Bark of root.	Black haw.
	Viburnum Opulus.	Bark.	Cramp bark.
71. Valerianaceæ.	Valeriana officinalis.	Rhizome and roots.	Valerian.
72. Cucurbitaceæ.	Citrullus Colocynthis.	Fruit.	Colocynth.
	Ecballium Elaterium.	Neutral principle from substance deposited by juice of fruit.	Elaterin.
	Cucurbita Pepo.	Seed.	Pumpkin seed.
73. Campanulaceæ.	Lobelia inflata.	Leaves and tops.	Lobelia.
74. Compositæ.	Grindelia robusta.	Leaves and flowering tops.	Grindelia.
	Grindelia squarrosa.	Leaves and flowering tops.	Grindelia.
	Artemisia pauciflora.	Flower-heads.	Santonica.
	Erigeron canadensis.	Oil from herb.	Oil of fleabane.
	Anacyclus Pyrethrum.	Root.	Pellitory.
	Arnica montana.	Flower-heads.	Arnica.
	Anthemis nobilis.	Flower-heads.	Chamomile.
	Matricaria Chamomilla.	Flower-heads.	German Chamomile.
	Taraxacum officinale	Root.	Dandelion.
	Lactuca virosa.	Milk juice.	Lactucarium.
	Eupatorium perfoliatum.	Leaves and flowering tops.	Thoroughwort.
	Arctium Lappa.	Root.	Burdock.
	Calendula officinalis.	Ligulate florets.	Marigold.

[1] See also Family No. 51, *Ternstræmiaceæ*.

2. The Animal Drugs.

Class.	*Family.*	*Name of Animal.*	*Part Used.*	*Name of Drug.*
Insecta.	Hemiptera.	Pseudococcus cacti.	Dried female insect.	Cochineal.
	Coleoptera.	Cantharis vesicatoria.	The dried beetle.	Cantharides.
	Hymenoptera.	Apis mellifera.	Secretion from the honeycomb.	Honey.
	H		Concrete substance from the honeycomb.	Yellow wax.
Pisces.			Oil from fresh liver.	Cod liver oil.
			Fossil remains.	Ichthyol.
Mammalia.			Concrete fatty substance.	Spermaceti.
	P		Internal fat of abdomen.	Lard.
			Ferment from glandular layer of fresh stomach.	Pepsin.
			Enzymes from fresh pancreas.	Pancreatin.
	Rum...		Internal fat of abdomen.	Prepared suet.
			Purified fat of wool.	Hydrous wool fat.
			Thyroid gland.	Desiccated thyroid glands.
			Suprarenal gland.	Desiccated suprarenal glands.
			Thymus gland.	Thymus extract.
			Testicle.	Testicular extract.
			Pituitary body.	Pituitary extract.
			Mammary gland.	Mammary extract.
			Ovary.	Ovarian extract.
			Spleen.	Splenic extract.
		Bos Taurus.	Sugar from whey of cow's milk.	Sugar of milk.
			Fresh bile.	Ox gall.
			From tendons, etc.	Gelatin.
			Organic acid from tallow.	Stearic acid.
		Moschus moschiferus.	Dried secretion from preputial follicles.	Musk.
	Equidæ.	Equus Caballus.	Injection into blood of germs of Diphtheria.	Antidiphtheritic serum.
			Injection into blood of germs of Tetanus.	Antitetanic serum.
			Injection into blood of cultivations of streptococci.	Antistreptococcic serum.
			Injection into blood of cultivations of pneumococci.	Antipneumococcic serum.
			Injection of snake-venom into blood.	Antivenomous serum.

Class.	*Family.*	*Name of Animal.*	*Part Used.*	*Name of Drug.*
Mammalia.	Equidæ.	Equus Caballus.	Injection into blood of germs of Plague.	Antiplague serum.
			Injection into blood of germs of Cholera.	Anticholeraic serum.
			Injection into blood of germs of Typhoid Fever.	Antityphoid serum.
	Rodentia.	Lepus cuniculus.	Injection into blood of virus from spinal cords of other rabbits killed while affected with rabies.	Hydrophobia antidote.



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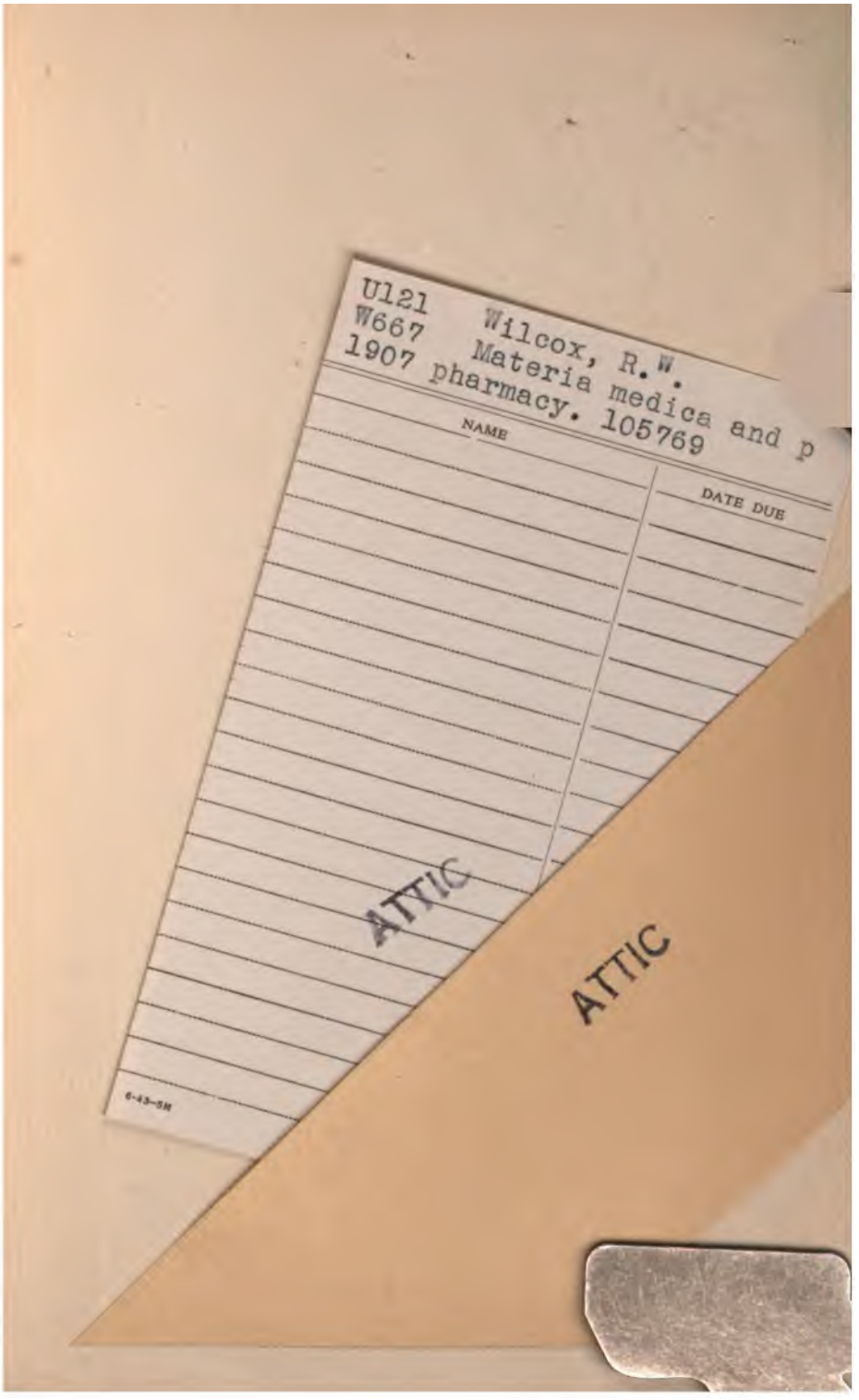
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